Eugene B. Power
Universal Microfilms
313 N. First St.
Ann Arbor, Mich. -1

Vol. XV, No. 10
April, 1959

INDUSTRIAL QUALITY CONTROL

In This Issue

Random Balance

Airframe Industry SQC

13th Annual ASQC Convention

QUALITY through Scientific Methods

JOURNAL OF THE AMERICAN SOCIETY FOR QUALITY CONTROL

Here's how Q-trol helps you hold the quality of your product without all that paper work.

The Q-trol computer is used in industry to *mechanize* sampling plans. When you install Q-trol on your inspection line it computes the status of your lot or process and indicates when that lot or process does not meet the AQL (Acceptable Quality Level) *set by you*. Use of the computer, operation of which is based on Wald's Theory of Sequential Analysis, does away with the great amount of paper work and equations you may now be doing in your quality control program.

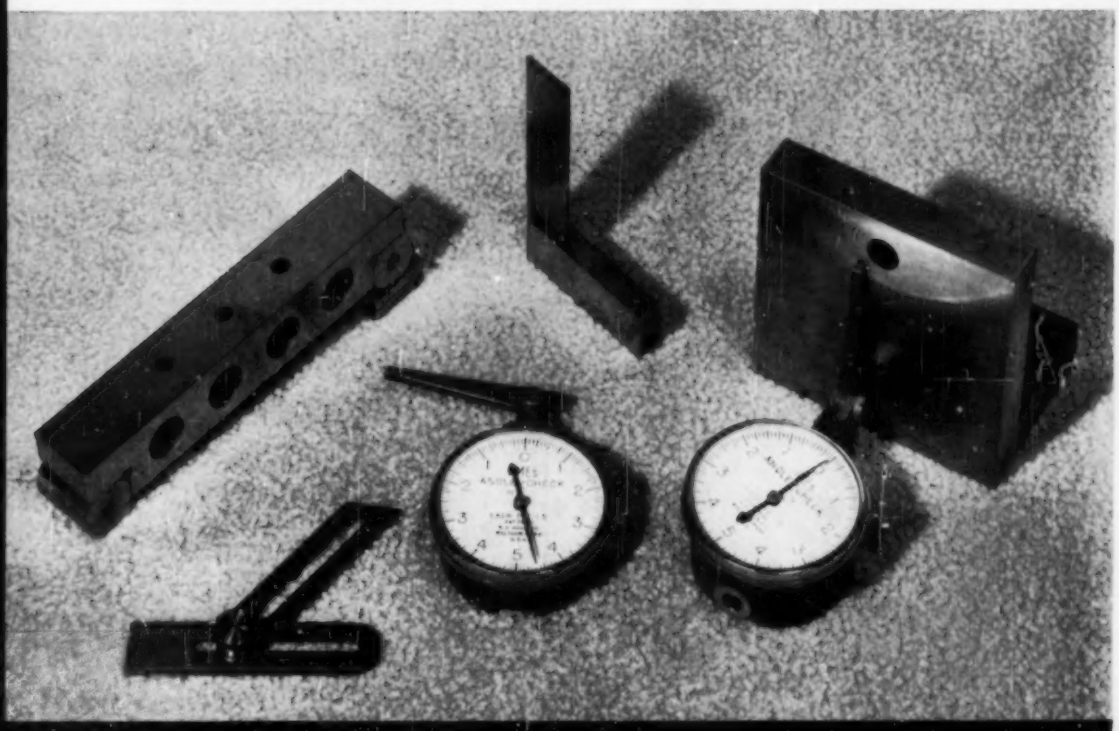
Q-trol can be operated by non-technical personnel, once the standards and specifications you set are "entered" into the computer by a set of dials located at the top of the Q-trol cabinet. A simple, easy-to-follow set of counters and lights lets you know when the lot or process is in or out of control. There are Q-trols for either automatic or manual operation. They range in standard sizes from the 1 to 4 parameter units up to specially installed units to suit your own particular needs.

Write, wire or call today for our brochure and technical sheet about this important development in the quality control field.

Q-trol has been proven in industry.

texas electronic products corp.
5114 WEST JEFFERSON BLVD. DALLAS, TEXAS

Check Angles Quickly and Precisely with the New



AMES DIAL TYPE ANGLE CHECK®

ANGLE CHECK, a new dial type measuring instrument, offers you a fast, inexpensive and extremely accurate method for checking all types of angular parts.

ANGLE CHECK is available in two models: Model V for vertical work and Model H for horizontal. Either model will accommodate any AMES 200 Series back. Contact blades can be specified in various shapes and lengths to meet your exact requirements.

Built to give long, trouble-free service, ANGLE CHECK will save hours in checking predetermined angles on simple and intricate shapes. Set ANGLE CHECK to master, protractor or sine bar.

The contact blade can be set simply and quickly without tools to a predetermined angle with the dial "0" under the indicator hand. A range of 10°—from 5° minus to 5° plus—in increments of 5′ can be obtained. ANGLE CHECK is accurate to 5′. Write today for complete information.

Representatives in Principal Cities

B.C. AMES CO.

32 Ames Street, Waltham 54, Mass.

Canadian Office — B. C. Ames Co., 45 Oriole Parkway, Toronto

MANUFACTURERS OF MICROMETER DIAL INDICATORS AND GAUGES

EDITORIAL BOARD

MASON E. WESCOTT, *Chairman*
University College, Rutgers University, New Brunswick, N. J.

CHARLES A. BICKING
The Carborundum Co.

ALBERT H. BOWKER
Stanford University

A. C. COHEN, JR.
University of Georgia

ALLEN T. CRAIG
State University of Iowa

CECIL C. CRAIG
University of Michigan

HAROLD F. DODGE
Rutgers University

A. V. FEIGENBAUM
General Electric Co.

ENOCH B. FERRELL
Bell Telephone Laboratories, Inc.

DAME S. HAMBY
North Carolina State College

CHARLES R. HICKS
Purdue University

HOWARD L. JONES
University of Chicago

B. H. LLOYD
Price Waterhouse & Co.

CARL E. NOBLE
Kimberly Clark Corp.

MARY N. TORREY
Bell Telephone Laboratories, Inc

EDWARD M. SCHROCK
American Radiator and Standard Sanitary Corp.

1958-59 SOCIETY OFFICERS

President
C. E. FISHER
Bell Telephone Laboratories, Inc.
New York, N. Y.

Vice Presidents
CLARENCE R. BURDICK
Houdaille Industries, Inc.
Detroit, Mich.

A. V. FEIGENBAUM
General Electric Co.
New York, N. Y.

J. Y. MCCLURE
Convair Div. of
General Dynamics Corp.
Ft. Worth, Texas

ELLIS R. OTT
Rutgers University
New Brunswick, N. J.

Executive Secretary
L. S. EICHELBERGER
A. O. Smith Corp.
Milwaukee, Wis.

Treasurer
ALLAN M. HULL
United Air Lines
San Francisco, Calif.

Junior Past President
LEON BASS
General Electric Co.
Cincinnati, Ohio

1958-59 EXECUTIVE DIRECTORS

D. G. BROWNE
The Broderick Co.
Muncie, Ind.

ROCCO L. FIASCHETTI
Ansco, Division of General Aniline & Film Corp.
Binghamton, N. Y.

GERALD J. LIEBERMAN
Stanford University
Stanford, Calif.

AUGUST B. MUNDEL
Sonotone Corp.
Elmsford, N. Y.

WARREN R. PURCELL
Raytheon Mfg. Co
Newton, Mass.

ADVISORY COUNCIL

E. U. CONDON, *Chairman*
Department of Physics
Washington University
St. Louis, Missouri

M. HERBERT EISENHART, *Chairman*
Bausch & Lomb Optical Co.
Rochester, New York

HERMON F. SAFFORD, *President*
Ohio Rubber Co.
Willoughby, Ohio

WALTER A. SHEWHART, *Retired*
Bell Telephone Laboratories, Inc.
Murray Hill, New Jersey

DIVISIONS OF ASQC

Administrative Applications Division
CARL E. NOBLE
Kimberly Clark Corp.
Neenah, Wis.

Aircraft & Missiles Division
PAUL E. ALLEN
Beech Aircraft Corp.
Wichita, Kans.

Automotive Division
DONALD M. SPATH
General Products Corp.
Jackson, Mich.

Chemical Division
PAUL K. LEATHERMAN
Malinckrodt Chemical Works
St. Louis, Mo.

Electronics Division
HENRY A. SCHUMER
International Resistance Co.
Skyland, N. C.

Textile Division
KENNETH K. EDGAR
Henderson, Lindsy, Michaels
Greenville, S. C.

INDUSTRIAL QUALITY CONTROL

Vol. XV, No. 10 April, 1959

EDITOR:

Mason E. Wescott
University College
Rutgers University
New Brunswick, N. J.

BUSINESS MANAGER:

William P. Youngclaus, Jr.

MANAGING EDITOR:

George R. Foster

PRODUCTION:

Alan T. Zingelman

DEPARTMENT EDITORS:

W. D. Baten, Book Reviews
P. C. Clifford, T. A. Budne, Problems
E. R. Ott, Practical Aids
R. A. Wylie, What's New
J. M. Juran, Management's Corner
M. E. Wescott, Scrap Box
Paul A. Robert, Supervisor's Circle
A. T. Zingelman, Section Briefs
L. S. Eichelberger, ASQC News

Contents

ARTICLES

Random Balance, Part I—The Missing Statistical Link in Fact Finding Techniques

Thomas A. Budne 5

Normal manufacturing, engineering, research and development activities as well as trouble shooting activities are predicated on the ability to find the facts. This is the first part of a three-part article in which Mr. Budne presents examples of the problem and the random balance approach to their solution.

Practical Statistical Quality Control in the Airframe Industry, Part I

J. Y. McClure 11

The basic principle underlying manufactured product quality is the quality of the raw materials used. In the first part of a three-part article, the author presents all phases of SQC of procured materials and tool manufacturing in the airframe industry.

DEPARTMENTS

What's New? 16

13th Annual Convention
Committee Meetings Schedule 24
Convention Program 25-27
Registration Form 28
Exposition Displays 29

Report of the Nominating Committee 31

Section Briefs 32

Section Calendar 34

ASQC Announces 41

Clinics, Conferences, and Courses 41

Product Education Service 42

Positions Available 43, 44

Positions Wanted 44

Consulting Services 44

Industrial Quality Control is published monthly by the American Society for Quality Control, Inc. Entered as second-class matter on Sept. 18, 1950 at the post office at Milwaukee, Wis.

Industrial Quality Control is sent to all members of the Society as one of the privileges of membership; yearly subscription is $3.00 of the membership dues. Subscriptions from non-members are not accepted. Subscriptions for company, public, and university libraries are: 1 yr.—$9.00; 2 yrs.—$17.00; 3 yrs.—$25.00; 5 yrs.—$40.00. Back issues of Vols. I-X are available at $6.00 per volume including index; Vol. XI, $9.00; XII-XIII-XIV, $10.00 ea. Individual copies are $1.00 each. Microfilm editions by volume are also available. The cost per volume is I-VII, $10.00; VIII, $1.50; IX, X, $1.60 ea.; XI, $1.70; XII, $1.85; XIII, XIV, $2.00 ea.

Orders for library subscriptions, back issues, and microfilm editions should be accompanied by remittance made payable to the American Society for Quality Control, Inc. *Orders under $3.00 must be accompanied by remittance.*

Industrial Quality Control is regularly indexed in the *APPLIED SCIENCE & TECHNOLOGY INDEX* published by The H. W. Wilson Company, 930 University Avenue, New York 52, N. Y.

Neither this magazine, nor any portion of it may be copied or otherwise reproduced without written permission of the copyright owner. Requests for copyright release should be addressed to the editor, Mason E. Wescott. The statements and opinions given in the articles and papers in *Industrial Quality Control* are the views of the authors and are not necessarily those of the Society.

Notification of address change should be sent both to the secretary of your section and to the Executive Secretary's office. Allow approximately seven weeks for the change to become effective.

Executive Secretary and Publications office: Rm. 6197 Plankinton Bldg., 161 West Wisconsin Avenue, Milwaukee 3, Wisconsin. Society's New York Address: Rm. 965, 463 West St., New York 14, N. Y.

Address all correspondence to American Society for Quality Control, Inc., Rm. 6197 Plankinton Bldg., 161 West Wisconsin Ave., Milwaukee 3, Wisconsin.

Copyright 1959
American Society for Quality Control, Inc.
Printed in U.S.A. All rights reserved

Always . . .
ON THE SPOT!

Here is a fast, accurate gage that has a hundred uses. It can be used at the machine, in production, in the inspection department . . . and in the gage laboratory.

Simple to use, it requires no special skill on the part of your personnel. It weighs only 3 lbs.

MICROtrol 170 transistorized gaging system, which includes a battery-powered amplifier and four types of interchangeable gage heads, is for use with production comparators, height gages, snap gages, ID or OD gages and similar bench inspection devices.

INDICATOR GAGE HEAD used with standard height gage-stand for surface plate work.

AGD GAGE HEAD used with snap gage for production line inspection.

FRICTIONLESS GAGE HEAD used with comparator stand to check production parts.

Features

- *Only 2 control knobs*
- *One adjustment zeros both scales*
- *Large meter with 4.6″ scale*
- *Dual range—from either ± .0003″ to ± .003″ or ± .001″ to ± .010″*
- *Accurate—transistorized throughout*
- *Pocket-sized—5¾″ square by 3⅛″*
- *Mounting adapters and gage head stored in cover*
- *Carrying case handle doubles as amplifier stand*
- *Lightweight—weighs only 3 lbs.*
- *Battery powered—can be used anywhere*
- *AA dry cells can be used in emergency*
- *Gage heads interchange quickly and easily*

Basic System . . . complete with gage head and amplifier

. . . only $340.00

Contact your nearest Cutler-Hammer office or—
Order Direct from

AIRBORNE INSTRUMENTS LABORATORY

1345 NEW YORK AVENUE, HUNTINGTON STATION, L. I., NEW YORK

A DIVISION OF CUTLER-HAMMER, INC.

Random Balance

Part I—The Missing Statistical Link in Fact Finding Techniques

THOMAS A. BUDNE*

Statistical Engineering Consultant, Great Neck, N. Y.

Editorial Note

This article will appear in *Industrial Quality Control* as three parts. Part II—Techniques of Analysis will appear in the May issue and Part III—Case Histories will appear in the June issue.

MANUFACTURING, ENGINEERING, RESEARCH AND DEVELOPMENT are constantly faced with problems of fact finding in their normal activities as well as in their trouble shooting activities. The technical personnel involved in these activities may well be viewed as detectives, picking up and following clues which will lead them to the source of the problem. The experienced and seasoned detectives of science and technology have learned to appreciate the clues of variation as the most direct path to follow. Consider the simple, indisputable logic that where there is an effect, there is a cause; where there is variation in a measured characteristic of a product or process, there is a varying force which creates it. The solutions to most problems lend themselves to this logic.

In product development, for example, if the detective can track down the major sources of variation in a product characteristic, which he hopes to improve, he will then know what he must do to achieve his objective. A sample list of some specific illustrations of problems which require this identification of sources of variation are:

1. Which variables should be modified to achieve a more desirable product?
2. Why is there so much lack of reproducibility in the method of measurement itself?
3. Which variables in the manufacturing process are responsible for the undesirably large variation in the product—or even for the undesirably large process capability?
4. Which variables should be modified for better tool life or higher productivity?
5. What tolerances in complex products would be realistic and allow performance within specifications?
6. Which elements of design most affect reliability and mean time to failure?

*The writer is indebted to members of the staff of Rath & Strong, Inc., with whom he was associated during the initial preparation of this article, for their valuable suggestions and criticisms.

Common sense and technical knowledge and experience are at all times the primary weapons for attacking such problems. Losses are measured by the amount of time in which the problem goes unresolved, and only too frequently this valuable time is wasted when it has become evident that the problem will not yield to the attack of the primary weapons alone. Yet attack after attack may be made and with each such successive attack the usually effective primary weapon insidiously degenerates into a very expensive guessing game. On the other extreme is the failure to bring the primary weapons into play immediately. Bringing in the heavy artillery, the complex statistical methods, manned by specialists, mathematical and statistical experts, cannot be condoned as an initial means of attack on a problem. The nonspecialists with their common sense and technical know-how may find a solution very quickly. This is a day-to-day occurrence which goes unheralded and unpublicized. We have learned long ago that it is best to follow the lessons of nature in not permitting complexity when simplicity will suffice.

In the type of problems illustrated above, it is clear that in each case a large number of variables can be listed as possible sources of effect on the problem. When common sense, technical knowledge, and experience alone fail, the critical facts and variables must be searched out with the sieves and spectacles of statistically planned techniques.

Simple preliminary investigations may quickly remove a large number of variables from the total spectrum of possibilities.* When what remains still covers a number of alternatives, the statistically designed experiment becomes the means of resolving the problem with a minimum of lost time.

It is not unusual to find that ten to twenty variables can be included in a list of the possible sources of a problem. A sampling of actual experiences shows the following:

(a) A foundry operation with a problem of excessive variation in casting quality listed seventeen variables as possible sources of trouble after initial eliminations.

(b) A chemical company with a problem of too much quality variation in a continuous process

*Budne, Thomas A., "SQC Can Be Made More Effective," *Industrial Quality Control*, Vol. XV, No. 6, Dec. 1958, p. 10-12.

had twelve possible sources of variation remaining.

(c) A testing laboratory boiled the possible sources of lack of reproducibility in a testing method down to fifteen variables.

(d) A plastics processing company could easily eliminate all but twelve variables as sources of erratic operation in its processing line.

(e) An electronics company had to evaluate twenty sets of tolerances in an electronic circuit simultaneously in searching for the means to reduce the range of variation in circuit outputs.

(f) A chemical development laboratory had to evaluate the effects of changing the quantities of fifteen ingredients simultaneously to find those changes or combination of changes which could produce a desired property in a product.

The statistically designed experiment, then, becomes the next logical step and the following questions arise:

1. How many variables can be programmed into the experiment and which ones shall they be?
2. How many levels for each variable selected?
3. What is the best design for the experiment?
4. How many test runs will be required?
5. Under what conditions and under whose responsibility will the experiment be executed?
6. What is the nature of the analysis to be applied to the experimental data and who will be responsible for carrying it out and for drawing conclusions?

The answers to these important basic questions above provide an opportunity for a discussion of *Random Balance Designs* in contrast to complete balance designs.

To provide a realistic basis for discussion, let us use the problem of experience (b)—the chemical company with a problem of product variation. There were 12 variables to be considered: four temperatures, a pressure, rates of feed for three ingredients, speed of mechanical stirring, reaction time cycle, cooling temperature, cooling time.

Alternative answers to the questions raised above could be:

A 1/64 replicate of a 2^{12} factorial design programming all twelve variables with two levels each into an experiment with 64 test runs. Of 66 two-factor interactions, ten will be deliberately confounded with ten others, while the remaining 46 two-factor interactions will be confounded with four-factor interactions. The design will be planned so that if any two-factor interaction appears likely, it will be confounded with an unlikely four-factor interaction.

OR

A 1/128 replicate of a 2^{12} factorial design programming all 12 variables at two levels each into an experiment with 32 test runs. The confounding problem, however, becomes quite complex.

OR

A meeting of minds of technical people and statisticians could reach an agreement that the experiment should consider only a specified and most suspected six or seven of the twelve variables. A ½ replicate of a 2^6 or a ¼ replicate of a 2^7 factorial design would then be appropriate. The problem of confounding will be relatively minor.

If there is a need to include more than two levels of one or more variables, the number of tests must be increased by at least 50 percent.

The nature of the investigation is such that it must take place under normal but carefully controlled production conditions, with production personnel and facilities, with the guidance of the statistical group.

The design of the experiment as well as the analysis and interpretation of the experimental data, are necessarily and solely the responsibility of the statistician.

The analysis will use the usual analysis of variance table, testing for significance of each variable and all interactions at predetermined levels of significance. Any doubtful results for reasons of confounding or otherwise will require a smaller clarifying experiment.

The alternative recommended here is:

A *Random Balance Experiment* which contains all the variables which can possibly contribute to the problem, regardless of number. For the purposes of screening and maximum simplicity, no more than two levels of each variable are recommended, but any reasonable number of levels can be programmed for each variable, where it is desirable. Between 30 and 50 tests will be required, depending on the reproducibility of the measuring procedure itself and on the number of times more than two levels are used. The experiment will be run under normal production conditions, primarily under the direction of the personnel responsible for resolving the problem. The analysis will first take the form of a graphical presentation of the experimental results, carried out by the technical personnel conducting the experiment. The assistance of the statistician is required only if complexities develop in the analysis.

This final alternative will be meaningless without a thorough discussion of its underlying philosophy, which follows.

Random Balance Philosophy

Wherever a problem exists, the evidence of its existence generally manifests itself in some measurable form of variation: variation in product, variation in test measurements, variation within each unit measured several times, or variation from unit to unit or from hour to hour or day to day or month to month; variation from machine to machine, or shift to shift or operator to operator.

The problem becomes evident when any one or more of these or other forms of variation becomes excessive, and results in economic loss of some form. Lack of consistently good quality which affects sales, troubles in maintaining the production schedules and excessive tool replacement, are a few examples of causes of economic loss.

Whenever variation exists there are one or more forces in action creating this variation. Philosophically one may say that almost any factor or detail which can affect the environment of the variation in question is a contributing element. When a man walks across the floor of a manufacturing operation, he contributes some variation to the operation—small—unmeasurable, but a contribution nevertheless. In this way the total number of elements contributing even the most minute amount to the total variation in product can easily be very large.

It would be absurd to believe that all elements made an equal contribution to the total effect. Experience after experience indicates that not only is such not the

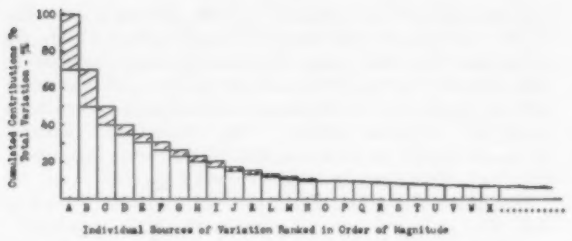

100
80
60
40
20
Cumulated Contributions % Total Variation - %
A B C D E F G H I J K L M N O P Q R S T U V W X
Individual Sources of Variation Ranked in Order of Magnitude

Figure 1—The Mal-Distribution of Causes to a Total Effect

case, but, in fact, that where the list of possible contributors is large, the magnitude of contributions covers the complete range of small to large contributions and that if all contributions were ranked in magnitude and cumulated, we would have a picture such as shown in Fig. 1.

It becomes readily clear that of a large number of contributors only 2, 3 or 4 of the largest are frequently responsible for as much as 50 percent or more of the total effect. We shall call this phenomenon the mal-distribution principle or the mal-distribution assumption.

In a very appropriate analogy recently used by Dr. W. E. Youden, the magnitude of an individual effect, variation or otherwise, contributed by each element or variable, may be considered as the elevation of a hill or mountain. The location of a mountain or a hill in an unexplored geographical region is the identification of the variable making the contribution.

Every unexplored region consists of points of varying elevations. In a mountainous area, all mountains have different elevations but inevitably a very few will be found which stand head and shoulders above the others. Ranking the altitudes and cumulating them, we would again see the picture of Fig. 1 above. In a region which consists only of hills, again a very few hills will appear relatively as mountains compared to the lesser hills. Even in an area of plains, there are mounds which appear relatively as mountains.

In a region of a few mountains and many hills and mounds, it is clear that if the ranking mountains are removed one by one, we need not go too far before what is left appears relatively level and that the removal of any one remaining effect reduces the total effect by a very insignificant amount. In the actual problem this is the point at which the removal of the remaining largest contributor to the problem brings no economic or practical advantage whatever; the cost of removal having equalled or even far exceeded the economic gains.

On the other hand, indiscriminate removal of individual effects can be an extremely uneconomical affair. It means nothing to locate and remove large numbers of hills if even one mountain escapes detection only because the number of tests, having been restricted, did not permit exploration of all areas of the unexplored region.

The random balance design is a method for screening all possible contributing variables in a limited number of test runs. Its primary objective is to locate all the mountains by a rough survey of all areas of the unknown region. If twenty possible contributing variables were programmed into a random balance designed experiment, it is almost certain that all the relative mountains among the twenty would be located. (Only the unusual higher-order interactions may possibly escape detection.) We are assuming, of course, that the mal-distribution of causes to a given effect is always a fact—that a very few of the contributing causes have major critical effects and the large majority have minor and relatively insignificant effects. This assumption is well supported by experience.

It is appropriate to note that only in the case of the electronics company were there as many as five critical variables. Of the five, two had significantly more effect on circuit output than the other three. In the other illustrative situations, two or three of the variables in each case were primarily responsible for the existence of the problem. Control or modification of these two or three critical variables was sufficient to resolve the problem.

Almost all mathematical and statistical theories rest on certain basic assumptions. Euclidian geometry has its axioms and postulates. Modern statistical theory rests heavily on the assumption that the observations come from a normal distribution. When these assumptions fail, as they sometimes do, then conclusions dependent on methods embodying such assumptions may be incorrect. We can ask no more than that any assumption which is made be in harmony and agreement with life and nature. The validity of an assumption can be judged only in the light of experience, or where no experience exists, on the credibility of the assumption. The mal-distribution assumption of random balance is at least as acceptable as that of the normal distribution assumption.

Accepting the mal-distribution assumption, there is no limit to the number of variables which may be programmed into an experiment. If 20 variables include all the critical few, then it can do very little harm to add another ten variables into the experiment, since they must be in the category of the "insignificant many". The mountains will continue to protrude. If on the other hand, an additional ten variables contain a mountain not contained among the original 20 variables, then it becomes most imperative that these ten should also be included in the experiment.

The obvious conclusion is that "all" possible contributing variables should be included in the experiment if the screening objective is to be achieved.

It is possible that one or more of the critical variables may escape inclusion in the design. Such variables remain as unprogrammed random effects, in contrast to the randomized programmed effects, and must reflect themselves into the unexplained variation which the analysis will show. The sequential feature of the analysis of the early random balance test results will indicate the likelihood that such critical variables have been overlooked and permit the inclusion of newly suspected variables in the design at any point in the experiment.

Thus the objective of the random balance experiment differs quite sharply from the objectives generally associated with a factorial experiment or fractional factorial experiment.

An experimenter cannot hope to include all possible contributing variables into a fractional factorial experiment without getting into an impossible or highly unpracticable number of tests, or suffering under the burden of every complex confounding problem. The limited area that the factorial design does explore is explored much more thoroughly than can be achieved by a random balance experiment. Instead of judging that elevated areas are mountains by comparison to other elevated areas included in the explored space, it measures the elevation of all hills as well as all mountains that happen to lie in the more restricted

area under exploration. The yardstick of measurement is residual variation, which by random balance philosophy is the variation created by all the variables not included in the experiment, by the mounds, hills, and mountains excluded from the actual region of exploration.

"Statistical significance" is an expression of great importance in the process of analyzing the results of a factorial experiment. It is the statistical expression meaning that what appears to be a hill or a mountain or even a mound is truly what it appears to be and is not a mirage created by the whims of chance.

The statistical test of significance may be compared to a magnifying procedure. Differences in objects always exist, even though they are purported to be identical. When they are not visible to the naked eye, the differences may become visible under a magnifying glass. If not visible under a magnifying glass, they may become visible under a microscope. If not visible under a microscope, they may become visible under an electron microscope of tremendous magnification. And if we may again become philisophical, if the differences cannot be seen by any existing scientific means, then this is only the fault of man's limitations.

So it is with statistical tests, with the exception that they do not have man's limitations. Differences of any microscopic magnitude whatever may be seen by a properly executed statistical test merely by increasing the number of replications, the statistical means of magnification. When the differences are thus seen, they are "statistically significant".

The practical question, then, is how much difference is of interest to us and at what degree of magnification do we pass into an academic area of no practical importance whatever? The reasonable answer supplied by the random balance philosophy in exploring an unknown region is that "the importance of any variable is measured by the magnitude of its effect as compared to the individual effects of all the other variables." Any variable whose effect may be found to be "statistically significant", but small, compared to the effects of other variables, is not important.

With an understanding of what goes on behind the scenes, it is possible to place the random balance design and the factorial design in their proper places in the statistical world of experimentation.

When it is necessary to screen a large number of variables in a limited number of test runs for the purpose of identifying the few critical variables from among the relatively unimportant many, the random balance design is most appropriate and effective.

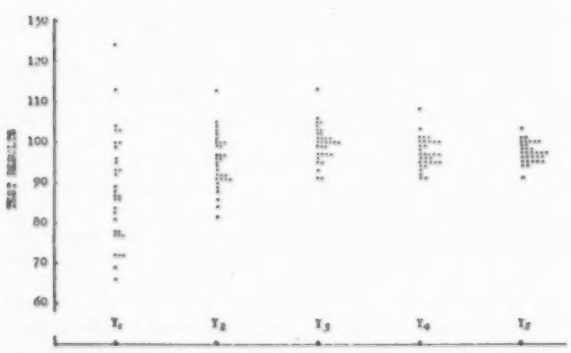


Figure 2—Frequency Distributions of Test Data Illustrating the Reduction in Variation as the Influences of Critical Variables are Removed in Four Successive Stages (excerpt from Fig. 12 which appears in Part II)

If the number of variables to be screened is sufficiently small so that a fractional replicate of a factorial design can be used with the same limited number of test runs then extra dividends in the form of a sharper picture of the less important variables will be realized using the factorial design. The choice of fractional factorial design becomes questionable when the confounding conditions become too complex.

The full and fractional factorial designs have had, and will always have, a very important place in experimentation. When it is necessary to get as clear a picture of the effects of each of a specific group of variables, no design is as effective as the factorial design (specific hypotheses). When it is not practicable to run a full factorial due to limitations in test runs then the fractional factorial achieves the same objectives at the expense of confounding selected interactions with other interactions and/or main effects with interactions.

The kinds of improvement in variation which we hope to achieve are illustrated in Fig. 2. We may have a condition equivalent to the frequency distributions of Y_1 or Y_2 and would hope to reduce such variation to the magnitude indicated by the frequency distributions of Y_4 or Y_5.

The most critical variable should show effects as may be seen in Fig. 3 for variables A and G. It will not require a t-test to verify the fact that these are truly

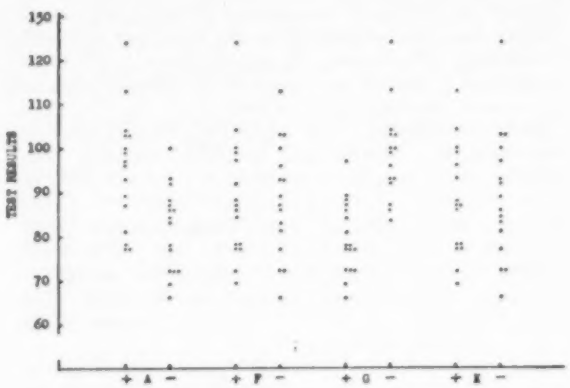


Figure 3—A Comparison of the Effects of Critical Variables, A and G, to the Effects of Unimportant Variables, F and K (excerpt from Fig. 5 which appears in Part II)

critical variables. Correction procedures, outlined later, will again allow the remaining most critical variables to stand out in a similar manner The correction process is continued until the successively corrected data no longer show a pronounced effect by any variable.

It would be good practice and common sense to vary these discovered variables deliberately to note that their indicated effect is real. Where there is reasonable doubt about something which can have economic and practical significance, a smaller confirming factorial experiment should follow. The question of economic and practical importance does not rest alone on the fact that a difference is real or not, but depends on the magnitude of the difference and the potential improvement which can be realized in the product.

The Random Balance Design

In its simplest and most unencumbered form, the random balance design is nothing more than a pure randomization of the levels of each variable among the

prescribed number of runs. (See Table I.) Briefly, it is a random sample from a full factorial design.

We would merely assign a number for each level of each variable and go down a random numbers table until we had selected enough 1's and 2's representing levels of A; 1's, 2's and 3's representing levels of B; 1's, 2's, 3's, 4's and 5's representing levels of D, etc. to fill each column. There would not necessarily be an equal number of each level within each column.

A slight restriction on this purely random design has definite advantages and will perhaps bring some measure of comfort to those accustomed only to fully balanced designed experiments. This restriction is that

TABLE I—A Random Balance Design

Test Run Number	Levels of Each Variable					
	A	B	C	D	. . . . .	Z
1	a_1	b_2	c_1	d_4	. . . . .	z_2
2	a_1	b_3	c_2	d_1	. . . . .	z_2
3	a_2	b_2	c_2	d_3	. . . . .	z_1
.	.	.	.	.	. . . . .	.
.	.	.	.	.	. . . . .	.
.	.	.	.	.	. . . . .	.
29	a_2	a_3	c_2	d_2	. . . . .	z_1
30	a_2	b_3	c_1	d_4	. . . . .	z_1

each column must contain an equal number of each level. This prevents the possibility that some levels may be inadequately represented in the experiment. The columns are then filled out by selecting the first 15 numbers from one to (say) 30 from a random number table and assigning level a_1 to these numbers in the design and filling out the remaining 15 spaces with a_2 (when we have only two levels). For three levels, the first ten numbers from one to 30 selected from the table receive the b_1's and the second ten the b_2's and the remaining ten the b_3's for third level. To achieve exact balance for all levels of all variables requires, of course, that the number of tests shall contain each number of levels as a factor. For example, if some variables have two levels, others three levels, and others five levels, then the number of runs must be a multiple of 30, which contains 2, 3 and 5 as factors. In fact, not very much will be gained by one who insists on being a perfectionist in this respect. If the variables contained 2, 3, 4, and 5 levels, the least common multiple would be 60. If conditions dictated a maximum of (say) 40 runs then it would be necessary to change the three level variables to two levels or four levels. However, there would be no great loss in the alternative of programming each of the three levels 13 times and filling the remaining run with a random selection of one of the three levels.

If in such a design it was obvious that run number three, for example, would present an impossible combination of variables for any reason whatever, there is no problem in replacing it with a new randomly selected combination. It is worthwhile to examine the finished design carefully to note that chance has not thrown a curve. An examination of each combination of two variables as in Table II may be desirable.

While each level appears an equal number of times, all combinations of the two variables do not appear. Such a condition can make the analysis difficult and should be corrected. However, exact balance in each such combinations is not necessary either. The greater the number of levels the more difficult it is to avoid empty cells.

The difficulties in setting up the design so that extreme unbalance can be avoided can be substantially

TABLE II—An Undesirable Design Condition

		A		
		a_1	a_2	
B	b_1		XXXXX XXXXX	10
	b_2	XXXXX XX	XXX	10
	b_3	XXXXX XXX	XX	10
		15	15	

reduced by a further modification of the pure random balance design. This further modified design has already been given a name—*Multiple Balance* design. Variables are grouped, and each group is programmed into a factorial or fractional factorial design. The combinations thus obtained in each of the two or more groups are then randomized with each other. As an illustration consider the following variables with their corresponding number of levels:

Variable A with 2 levels — a_1, a_2
" B " 3 " — b_1, b_2, b_3
" C " 4 " — c_1, c_2, c_3, c_4
" D " 2 " — d_1, d_2
" E " 3 " — e_1, e_2, e_3
" F " 2 " — f_1, f_2
" G " 2 " — g_1, g_2
" H " 3 " — h_1, h_2, h_3
" I " 2 " — i_1, i_2
" J " 2 " — j_1, j_2

If there were to be 48 tests, then the variables could be grouped into the factorial designs shown in Table III.

Variables A, B, and C are programmed in a $2 \times 3 \times 4$ factorial design with 24 combinations; variables D, E, F, and G in a $2 \times 2 \times 2 \times 3$ factorial design with 24 combinations and variables H, I, and J in a $2 \times 2 \times 3$ factorial design with 12 combinations.

The final design of 48 tests will include each of the 24 combinations of the first group twice, each of the 24 combinations of the second group twice and each of the 12 combinations of the last group four times. Additional groups or individual variables can be added at will. It can be seen that other groupings are possible to give

TABLE III—Subgrouping Variables in Factorial Designs

		c_1	c_2	c_3	c_4
a_1	b_1	1	2	3	4
	b_2	5	6	7	8
	b_3	9	10	11	12
a_2	b_1	13	14	15	16
	b_2	17	18	19	20
	b_3	21	22	23	24

Group I

		f_1		f_2	
		g_1	g_2	g_1	g_2
d_1	e_1	1	2	3	4
	e_2	5	6	7	8
	e_3	9	10	11	12
d_2	e_1	13	14	15	16
	e_2	17	18	19	20
	e_3	21	22	23	24

Group II

		j_1	j_2
i_1	h_1	1	2
	h_2	3	4
	h_3	5	6
i_2	h_1	7	8
	h_2	9	10
	h_3	11	12

Group III

TABLE IV—Randomized Combinations from Individual Factorial Designs

	Group I	Group II	Group III
1	8	21	10
2	(2)	2	6
3	13	16	1
4	24	18	12
5	24	1	5
6	17	12	1
7	20	22	3
8	(3)	1	11
.	.	.	.
.	.	.	.
.	.	.	.
16	(5)	11	3
.	.	.	.
.	.	.	.
.	.	.	.
45	(4)	7	7
46	(1)	15	12
47	11	16	3
48	2	10	8

( ) indicates the five numbers referred to in the text

the same number of runs or some other number of runs. To combine the three groups illustrated above, we merely lay out the 48 runs and use a table of random numbers to fill out each column. This has been done in Table IV.

One method for doing this is as follows: Select random numbers from 1 to 48 (designate these as test runs) and assign the first 24 of these numbers or test runs, in the sequence selected, to the 24 combinations in the factorial design. Thus, if the first five numbers selected from the random number table are 46, 2, 8, 45 and 16, then combinations 1, 2, 3, 4, and 5, respectively, will be assigned to these test runs. When the first 24 test runs have been assigned for Group I, the remaining test runs are selected in the same way and again assigned the combinations 1 to 24. The combinations of Group II are assigned in the same way. The 12 combinations of Group III are similarly assigned to the first 12 test runs selected, to the second 12, to the third 12 and again to the last 12 test runs selected from the table of random numbers. The detailed design will then appear as in Table V.

TABLE V—A Multiple Balance Design

Test Run	A	B	C	D	E	F	G	H	I	J
1	a_1	b_2	c_4	d_2	e_3	f_1	g_1	h_2	i_2	j_2
2	a_1	b_1	c_2	d_1	e_1	f_1	g_2	h_2	i_1	j_2
3	a_2	b_1	c_1	d_2	e_1	f_2	g_2	h_1	i_1	j_1
.	.	.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.	.	.
48	a_1	b_1	c_2	d_1	e_2	f_1	g_2	h_2	i_2	j_2

The combination of levels in each group of variables is the random selection made in Table IV from the combinations in Table III. For example the $a_1b_2c_4$ combination for test run no. 1 is combination no. 8 in Table III which was randomly selected to be run no. 1 in Table IV.

Short cuts in the random assignments may be affected at the risk of failing to get a true random sequence. We may write the numbers 1 to 24 each on two index cards. The 48 cards may be "thoroughly" shuffled so that the final sequence of cards gives the sequence of test runs. This may be done separately for Group I and II. Group III would require that the number 1 through 12 should each appear on four cards.

There may well be some logical reason for grouping the variables. For example, there may be some particular reason to suspect possible interactions between some variables and not between others. This however, does not remove the burden of checking that all combinations of two variables in different groups do appear at least twice and preferably more. The chore of doing this can be tremendously eased if the combination of variables for each test run is put onto key-sort cards in which the edge holes are punched, corresponding to the test run conditions of the design (See Fig. 4.)

With such cards, it becomes a very simple matter to check out the numbers of combinations of levels of the variables which lie in different groups. The key-sort cards can be a tremendously valuable aid in the analysis of the data. A variety of useful techniques such as this have been evolved in the course of time and increased experiences.

(Part II of this article will appear in the May issue.)

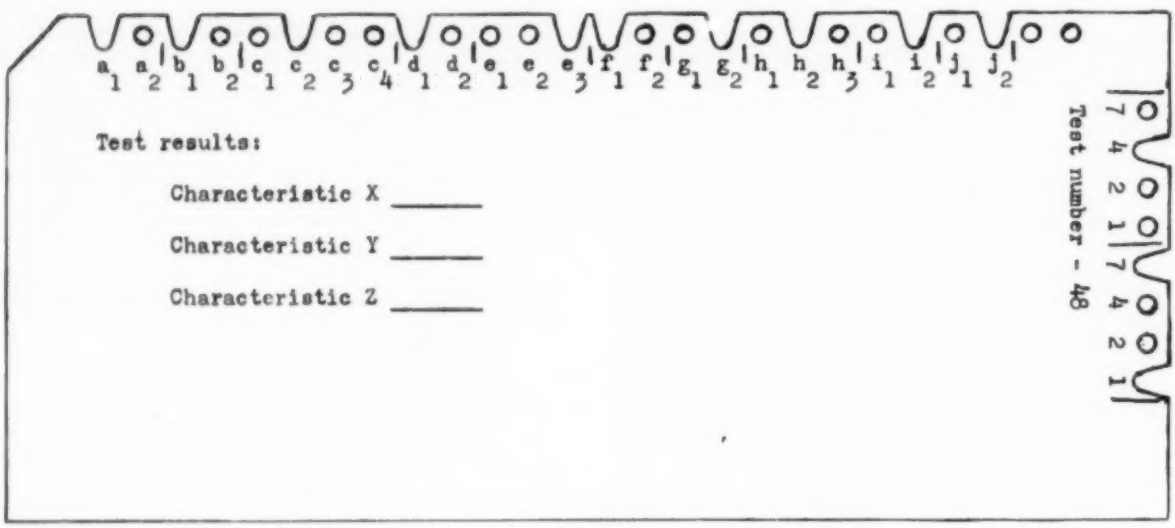

a1 a2 b1 b2 c1 c2 c3 c4 d1 d2 e1 e2 e3 f1 f2 g1 g2 h1 h2 h3 i1 i2 j1 j2
Test results:
Characteristic X _____
Characteristic Y _____
Characteristic Z _____
Test number - 48
7 4 2 1 7 4 2 1

Figure 4—Experimental Conditions and Test Results of a Single Test Run Recorded on a Key-Sort Card

Practical

Statistical Quality Control

in the Airframe Industry

Part I

J. Y. McCLURE

Convair, A Division of General Dynamics Corporation, Fort Worth, Texas

> ***Editorial Note***
>
> This is the first of three installments of Mr. McClure's article. Part II will appear in the May issue and Part III will follow in the June issue.

Statistical Quality Control of Incoming Materials

The quality of a manufactured product begins with the quality of raw materials used. Statistical quality control of modern aircraft should therefore embrace control of incoming materials. Appropriate applications of SQC to incoming materials will help to control the quality of materials entering the manufacturing areas for processing; and do this with reasonable and often much reduced costs.

The problem of procured materials control is two-fold. First, sound statistical techniques must be employed in the receiving inspection operation to discover and segregate defective materials. To the extent this can be done effectively, defective materials can be prevented from entering the shop manufacturing areas. Secondly, statistical evaluation of supplier's product quality should be performed as an aid to selective purchasing of materials.

Careful vendor selection thru product quality evaluation will enhance future reductions in costs of defect screening and processing in the receiving inspection department. This is an addition to cost reductions in subsequent fabrication and assembly operations.

SQC in Receiving Inspection

A practical SQC technique for receiving inspection can be defined in two words—scientific sampling. The volume of procured materials that flow through an airframe manufacturer's receiving inspection department dictates use of sampling or fractional inspection methods. The question is merely whether to use "homemade" sampling tables or true scientific tables that give consideration to the mathematical laws of probability.

Successful applications of sampling have been experienced in aircraft receiving inspection departments through use of *Sampling Procedures And Tables For Inspection By Attributes,* Military Standard, MIL-STD-105A.[1] A principal prerequisite to the use of MIL-STD-105A sampling is the development of Classification of Defects (CD) forms on all materials to be subjected to sampling inspection. CD development is a step in the right direction for standardization of inspection criteria whether or not sampling is to be used. This is especially true when the exact tool, gage, or method for checking each characteristic is specified on the CD form. CD's are often coordinated with the suppliers to secure a better understanding of quality requirements and gaging standards.

The selection of acceptable quality levels and the type of sampling tables to be used are other items that must be decided prior to sampling. Much time consuming discussion over which AQL's to use for sampling specific parts can be eliminated if standard AQL values are specified for whole groups of similar parts at the inception of a sampling program. One set of AQL's may be selected for all hardware items, another set for electrical items, etc. This will avoid the question of which AQL to use for sampling a new shipment of "ABC" springs or "XYZ" switches. Another advantage of standard AQL's is that they simplify MIL-STD-105A application by designation of specific tables for use by receiving inspectors.

The use of single-, double-, or multiple-type tables is dependent upon the circumstances and requirements of the individual airframe companies. The psychological and practical advantages of double- and multiple-type tables to single-sampling tables are pointed out by E. L. Grant.[2] If the stream of incoming materials is either extremely good or bad, multiple-type tables are economically advantageous because they will permit decisions from relatively small samples.

A change from "homemade" sampling and 100 percent sorting inspection practices to scientific sampling of procured materials is not generally characterized by phenomenal reductions in receiving inspection personnel. Rather, advantages and savings will be realized in other ways. Greater quantities of incoming material may be more precisely inspected than ever before without having to increase the number of inspection personnel. Through advance coordination of inspection criteria with the suppliers, reductions in receipts of defective shipments will most likely prevail. The SQC goal for receiving inspection—better assurance of the quality of

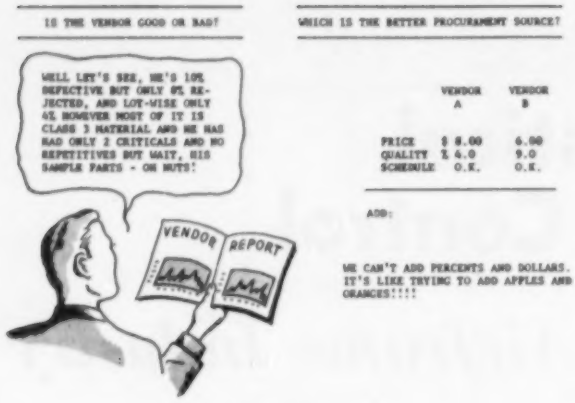

IS THE VENDOR GOOD OR BAD?
WELL LET'S SEE, HE'S 10% DEFECTIVE BUT ONLY 8% REJECTED, AND LOT-WISE ONLY 4% HOWEVER MOST OF IT IS CLASS 3 MATERIAL AND HE HAS HAD ONLY 2 CRITICALS AND NO REPETITIVES BUT WAIT, HIS SAMPLE PARTS - OH NUTS!
VENDOR REPORT
WHICH IS THE BETTER PROCUREMENT SOURCE?
VENDOR A
VENDOR B
PRICE $ 8.00 6.00
QUALITY % 4.0 9.0
SCHEDULE O.K. O.K.
ADD:
WE CAN'T ADD PERCENTS AND DOLLARS. IT'S LIKE TRYING TO ADD APPLES AND ORANGES!!!!

Figure 1

materials flowing from receiving into the manufacturing areas without increase in inspection costs—can be attained.

Statistical Evaluation of Suppliers Quality

Even an iron-clad ability to segregate acceptable lots of incoming material from the unacceptable lots would not resolve all the airframe manufacturer's procured material quality problems. It costs far more to process defective than non-defective lots. Mr. Leon Bass states,[3]

> *There is no use deluding ourselves about the cost of scrap or rejections of purchased material. In the long run; the user pays for it. Even though he might get credit for individual items, the prices to the user must reflect the total cost of the vendor's operation. If rejections are high, prices will have to be higher. If the user can do anything to lower the quantity of rejections, scrap or rework, at his own plant or at the vendor's, he stands to gain price-wise.*

Therefore, a program should be administered to encourage and aid the control of quality production at the supplier's facilities. This incentive program can be facilitated through a product quality evaluation procedure.

Many statistical, and also non-statistical, methods have been used to evaluate or rate individual suppliers on the basis of the quality of materials submitted.[4,5] Practically all rating systems have been confronted with the same enigma—variations in types of materials, size of lots, frequency of shipments, seriousness of defects, etc. The goal of an objective evaluation system is to attain a comparative rating figure that is descriptive of a supplier's quality of performance and that may be used to determine whether vendor A is superior to vendor B.

The problem of evaluating a supplier's performance is illustrated in Fig. 1.

One answer to this problem is to evaluate the vendor's quality of performance through the use of an "economic quality measurement."* Not that the measurement eliminates all the variations previously mentioned; but rather, it tends to combine them into one common entity—dollars. Defective items versus rejected items, large lots versus small lots, expensive items versus inexpensive items, serious defects versus minor type defects—all these may be equally evaluated in terms of dollars.

Measurement of a supplier's quality in terms of monetary losses resultant to the consumer (total cost) will enable a quality rating that can be analyzed in relation to supplier's bids on new contracts. A monetary measurement of supplier's quality performance can form the nucleus of a *selective* purchasing system, cost reduction program, and supplier quality incentive program. Figure 2 presents many of the quality expenses that are incurred when lots are rejected by the customer.

By collecting direct labor losses, material losses, and proportional overhead losses on inspection rejection data forms, SQC will be furnished data for evaluating vendor quality performance in terms of dollar loss to the airframe manufacturer.

So that vendors may be compared to one another even though they ship varying quantities and manufacture unlike products, a system of weighting is used. The unit cost of materials is divided into six categories and this roughly corresponds to the complexity of the item. Each vendor is then rated in each category in which purchases have been made. His rating is based on losses per thousand dollars of receipts above or below

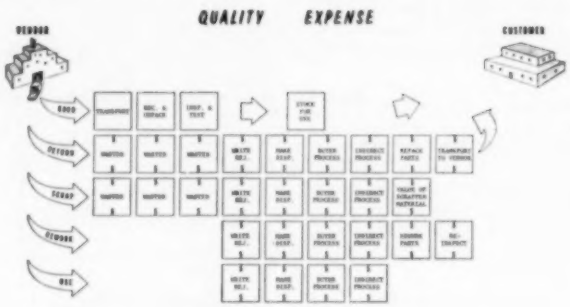


Figure 2

the average loss of all vendors in this category. Finally, an overall rating is given each vendor by weighting the categories of receipts to the division average cost per unit. His position is then determined by his dollar cost per thousand dollars of receipts compared to the average cost per thousand dollar receipts from all vendors. In this way, vendors are compared by categories and also by relative overall performance.

Vendor rating reports may be periodically compiled and distributed through the procurement department for necessary information and corrective action.

In the words of the English essayist, John Ruskin,

> *It's unwise to pay too much but it's worse to pay too little. When you pay too much you lose a little money—that is all. When you pay too little you sometimes lose everything because the thing you bought was incapable of doing the thing it was bought to do. The common law of business balance prohibits paying a little and getting a lot—it can't be done. If you deal with the lowest bidder it is well to add some for the risk you run. And if you do that you will have to pay for something better.*

The purchasing department's use of vendor evaluation data to select qualified suppliers will result in monetary savings and minimize the defect sorting operation in receiving inspection.

Statistical Quality Control in Tool Manufacturing

Equal in importance to controlling the quality of purchased materials and parts is the task of controlling the quality of the tools used to manufacture and assemble parts.

> *Proper tooling is essential for* **control** *of product quality under all circumstances; with low-quantity, short-duration production, tooling is a basic product-control technique.*[6]

*Such a system is now in operation at Convair—Fort Worth, a Division of General Dynamics Corporation.

Tool manufacturing costs are necessarily high at the inception of new contracts due to temporary tools used to expedite first deliveries, rapid improvement in design, etc. In order to operate within competitive bids and protect the margin of profit, it is imperative that rework and scrap costs be controlled at the optimum point of economy.

Statistical quality control techniques useful for controlling quality at this point can be separated into two general groups: quality auditing techniques and diagnostic techniques.

Quality Auditing

Quality auditing techniques are usually designed to measure the quality of performance by the percent defective and/or defects per unit type of measurement. These are fundamental statistical techniques which are discussed in all textbooks on SQC.

A variation from these techniques measures the amount of avoidable losses* generated, in relation to either the actual hours expended or the task accomplished. This is a very useful measure of comparison because it is weighted by actual dollar values rather than by demerit values.

The first steps in developing a quality audit are establishing a source of information, designing the paperwork, and routing the information through the proper channels. The following forms and procedures are basic and can be tailored to fit any facility.

Form 1 (see Fig. 3-A) is designed to compile the maximum information available through the tool manufacturing operations as well as after inspection. This form can be attached to the Tool Order when it is released to shop. It will give a step-by-step history of the manufacturing process. On this form can be recorded the time required for each operation, rework time prior to inspection, scrappage, rework time due to inspection rejection, reason for rejections, responsibilities, etc.

The statistics which can be compiled from data on this form can aid supervision and management by:

1. Isolating trouble areas and thus directing attention to areas of highest possible savings
2. Providing data for future estimates and bids
3. Facilitating manloading and work schedules
4. Establishing trends for forecasting purposes
5. Highlighting repetitive discrepancies/conditions

The processing of this form would be more expensive than Form 2 (Fig. 3-B) but it would provide more complete information. The economic alternative of methods must, of course, be considered.

Form 2, designed for recording inspection rejections, can be initiated and attached to the discrepant tool before returning it for rework. This form documents the reason for rejection, responsibility, and economic impact. It should be noted that responsibility is broken down by Department, Cost Center, and T. M. Number (Ass't. Foremen). This permits detailed pinpointing of troublesome and/or excessively costly areas.

The information recorded on these forms can be very expeditiously handled by I. B. M. techniques.

> *The use of tabulating equipment in Quality Control permits the collection of data on a large scale, on operations involving many and varied parts, where the cost of doing the job manually would be prohibitive.*[7]

Key punched cards and printed summaries, such as Form 3 (Fig. 3-C), provide permanent records from which many different types and combinations of reports can be made indicating:

1. Total rework and scrap costs per contract within responsible department
2. Total rework and scrap per discrepancy code within responsible department
3. Total rework and scrap per assistant foreman

The quality control engineer, through the use of such source data as a "watch-dog", will be guided in taking corrective action and in application of the more sensitive SQC techniques.

> *The I.B.M. method of recording, classifying, and summarizing inspection data aids in securing the maximum protection from inspection costs, by concentrating attention and effort where it is needed.*[5]

Diagnostic Techniques

1. *Tool Manufacturing*

A weekly tab run reflecting avoidable losses generated on each individual tool, work area, cost center, and department responsible can be furnished to tooling supervision. A weekly report measuring the quality performance of the departments and cost centers can also be distributed. The quality performance may be measured by using a frequency of avoidable rework, and scrapped hours and material cost per 100 actual hours expended. Control charts on the natural geographic breakdowns of a department will permit the isolation of trouble spots for further applications of SQC techniques and provide supervision with information as to when and where to exert pressure for quality improvement.

*Avoidable losses are those resulting from errors or poor techniques and do not include normal material waste or other costs necessary for manufacture. This phrase is illustrated later in the article.

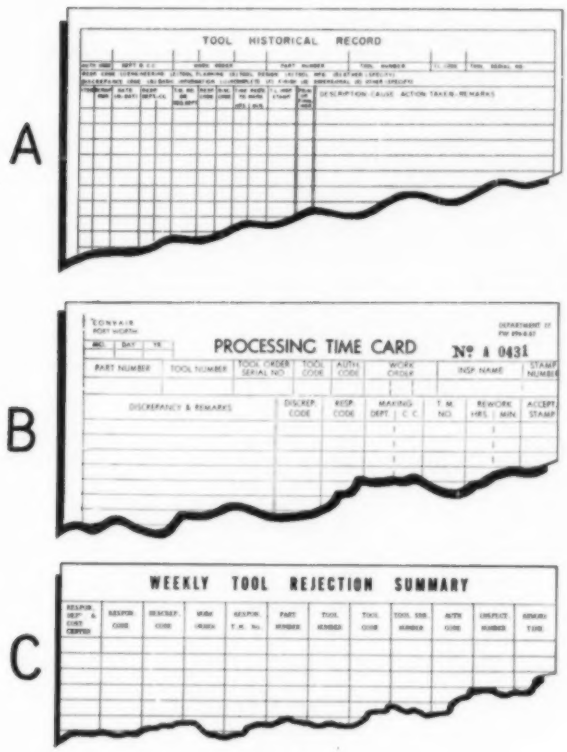


Figure 3

2. *Proofing the Tools for Production*

In most cases parts have not been manufactured that can be used for proofing the tools. Therefore, the tools should be sent to the production area on a trial release tag. Tooling inspection can be called in after trial parts are produced from the tool. If the trial parts produced do not meet specifications, the tool should be returned to Tool Manufacturing for further rework. On the other hand, if the parts are within specification, production inspection should check the parts produced and conduct a variation study on 25 or more parts. This variation study establishes the process level and capability of the newly designed tool. If the variation study indicates that the tool will produce acceptable parts, the tool can be accepted for production. The diagnostic techniques used for determining the tool capabilities are discussed in detail under the heading, "Fabrication Quality Control" in Part II.

University of Michigan QC Course

The University of Michigan has scheduled its twelfth annual intensive course in quality control by statistical methods for Aug. 17-27 on the campus in Ann Arbor. This is a basic, first course for executives and supervisory personnel; it is practical and mathematically non-technical. It includes the standard control charts and sampling acceptance plans together with other basic techniques.

Instruction includes lectures, demonstrations, practice sessions and conferences. The staff will include Professors I. W. Burr, Purdue University; C. C. Craig, University of Michigan; and E. G. Olds, Carnegie Institute of Technology as well as lecturers from industry. The fee of $15 includes a course syllabus, a textbook, and classroom supplies.

Please address inquiries to the course director, Professor C. C. Craig, 106 Rackham Building, Ann Arbor, Mich.

References

(1) Carlson, Fay, "A Survey of the Application of MIL-STD 105A in the Aircraft and Associated Industries," *Aircraft Supplement No. 1*, ASQC Aircraft Technical Committee, Nov. 1953, p. 118-124

(2) Grant, E. L., *Statistical Quality Control*, McGraw-Hill Book Co., Inc., New York, 1952

(3) Bass, Leon, "Quality Certification Minimizes Inspection," *Purchasing*, July 1955

(4) "Vendor Rating System—Incoming," *Quality Control Technical Handbook*, Hughes Aircraft Company, Aug. 1, 1955

Fitzgibbons, Robert G., "The Bendix Radio Vendor Quality Rating System," *Industrial Quality Control*, Vol. XI, No. 8, May 1955, p. 38-42

(6) Feigenbaum, A. V., *Quality Control; Principles, Practice, Administration*, McGraw-Hill Book Co., Inc., New York, 1951, p. 337

(7) Kohl, W. F., "Some Practical Applications of Tabulating Equipment in Quality Control," presented at the January 1955 meeting of the Milwaukee section of ASQC and the 11th Midwest Conference, ASQC, Oct. 1956

(8) Dunn, J. L., *Quality Control and Analysis*, International Business Machines Corp., San Diego, Calif.

(Part II of this article will appear in the May issue)

Section Code Number Key

The following list is the key to the Section Code numbers used by the national office. This number appears on your membership card; it must also be written in on your annual ballot that you have just received. Accordingly we are publishing the key here for your reference.

0100 Boston
0101 Buzzards Bay
0102
0103 Hartford
0104 New Hampshire
0105 New Haven
0106 Pittsfield
0107 Rhode Island
0108 So. Connecticut
0109 Western Massachusetts
0110 Worcester

0200 Albany
0201 Buffalo
0202 Corning-Elmira
0203 Mid Hudson
0204 Rochester
0205 Binghamton
0206 Syracuse
0207 Utica

0300 Metropolitan

0400 Hamilton
0401 Montreal
0402 Toronto
0403 Western Ontario
0404 Windsor
0405 St. Catharines

0500 Allentown-Bethlehem
0501 Danville-Sunbury
0502 Erie
0503 Harrisburg
0504 Lansdale
0505 Philadelphia
0506 Pittsburgh
0507 Scranton-Wilkes Barre
0508 Trenton

0600 Baltimore

0601 Piedmont
0602 Delaware
0603 Richmond, Va.
0604 Washington
0605 Cumberland

0700 Cleveland

0800 Cincinnati
0801 Columbus
0802 Dayton
0803 Parkersburg
0804 Toledo
0805 Youngstown
0806 Charleston
0807 Hamilton-Middletown
0808 Lima
0809 Lexington
0810 Akron-Canton

0900 Evansville Owensboro
0901 Grand Rapids
0902 Greater Muskegon
0903 Indianapolis
0904 Muncie
0905 N. E. Indiana
0906 South Bend Mishawaka
0907 Richmond, Ind.
0908 Battle Creek-Kalamazoo

1000 Greater Detroit

1100 Chicago

1200 Central Illinois
1201 Iowa
1202 Milwaukee
1203 Minnesota
1204 Racine
1205 Rockford
1206 Winnebago
1207 Kankakee-Joliet
1208 St. Charles

1300 Denver
1301 Kansas City
1302 Omaha-Lincoln
1303 St. Louis
1304 Wichita
1305 Tulsa
1306 Joplin

1400 Albuquerque
1401 Baton Rouge-New Orleans
1402 Dallas Ft. Worth
1403 Mexico City
1404 San Antonio
1405 South Texas
1406 Waco

1500 Birmingham
1501 Chattanooga
1502 Georgia
1503 Huntsville
1504 Louisville
1505 Memphis
1506 Tennessee
1507 Pensacola-Mobile
1508 St. Petersburg-Tampa
1509 Orlando-Cape Canaveral
1510 N. E. Tennessee

1601 Los Angeles
1604 San Bernardino
1605 San Diego
1608 Tucson
1609 Phoenix

1700 Japan
1701 Portland
1702 Salt Lake City
1703 San Francisco
1704 Seattle
1705 Sacramento

2500 International

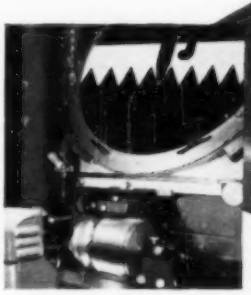
NEW

JONES & LAMSON EXTENDED RANGE OPTICAL COMPARATOR

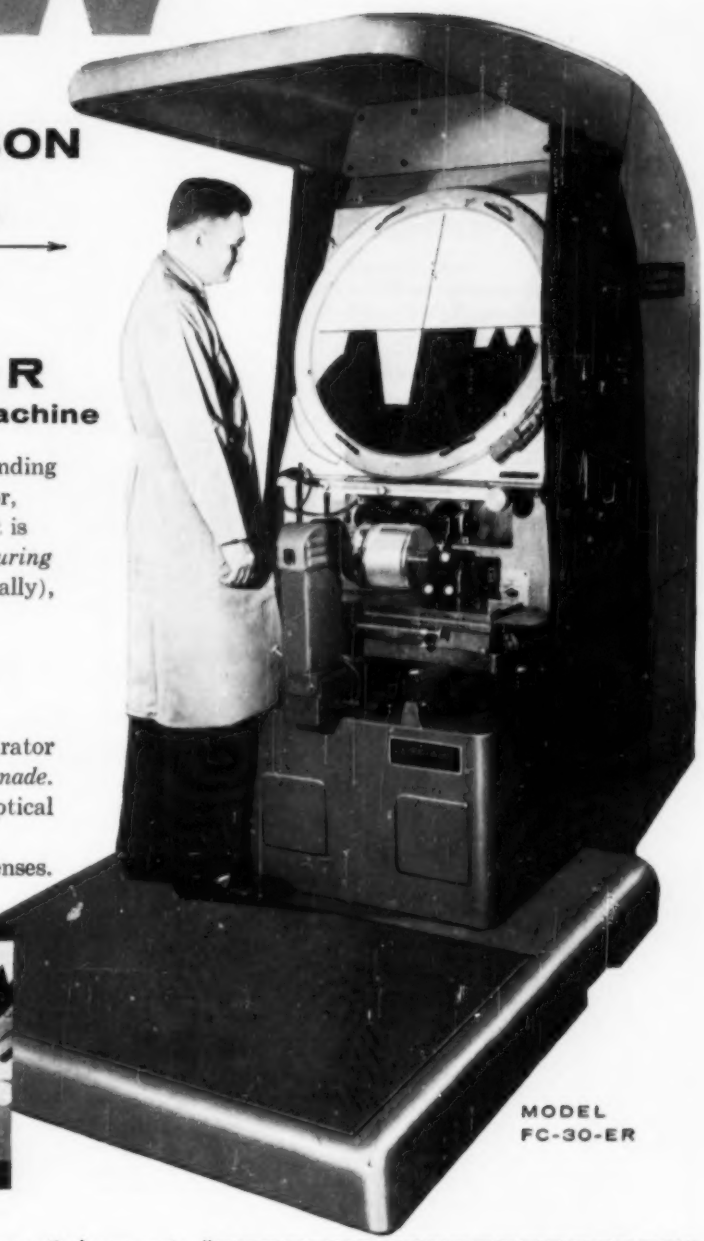
and Universal Measuring Machine

Again, Jones & Lamson fills a long-standing need by introducing a new Comparator, the FC-30-ER, with 30″ dia. screen. It is designed especially to give *added measuring capacity* (up to 10″ horizontally, 8″ vertically), and *added work capacity* (200 lbs. and more, on a rugged 8″ x 32″ table, supported on precision rolls and twin heavy duty columns).

This new Extended Range J & L Comparator is *the largest standard 30″ Comparator made.* It includes J & L's True Telecentric Optical System, Adjustable High Intensity Illumination and Precision Matched Lenses.



The FC-30-ER, equipped with J&L's NEW Lead Amplifier, affords precise inspection of thread lead to .0001″. The Amplifier produces up to a 500:1 amplification of any lead error in threads ranging from 4 to 70 pitch.



MODEL FC-30-ER

"World's oldest and largest builder of precision optical comparators"

JONES & LAMSON

JONES & LAMSON MACHINE COMPANY, Dept. 710, 510 Clinton Street, Springfield, Vt., U. S. A.

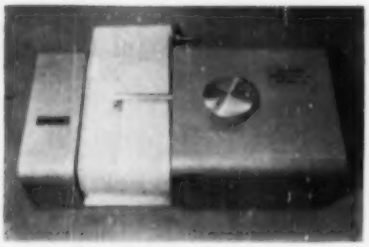
Please send me Comparator Catalog GL5803, which describes the complete line of J&L Optical Comparators.

name _____ title _____ street _____

company _____ city _____ zone _____ state _____

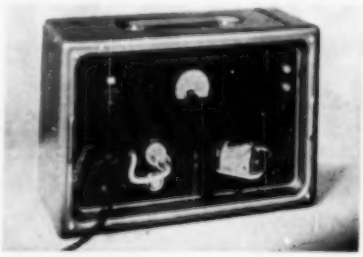
What's New?

ROY A. WYLIE, *Editor*
Ampex Corporation



P-2-4—Continuous, accurate integration of existing regular size chart records and the 3 inch or 4 inch wide charts used extensively with pneumatic control systems can now be accomplished with the recently developed Royson Portable Planimeter. Conversion of the unit from linear use to square root or visa versa is easily accomplished by changing the cam. Linear accuracy is one-half of 1 percent while accuracy on square root charts is one-half of 1 percent at the upper half of the scale and 1 percent at the lower end of the scale. The Royson Planimeter is easily operated with the chart being fed through the unit by a variable speed electric motor, speed being controlled by a foot rheostat to permit accurate tracing with optimum chart speed. As the chart is run through, a large hand knob permits the operator to cause the small index point to follow the curve on the chart for integration purposes. Thus, if the chart is recording rate of flow, the integrated total on the Planimeter will be the actual gallons or pounds of material that have gone through the meter. The output of the Planimeter is read on a five digit counter which can be reset to zero. Size of the unit for 4 inch wide charts is 8 inches wide by 15 inches long by 4¼ inches high and it can be set on a desk top and plugged into the 110V AC line.

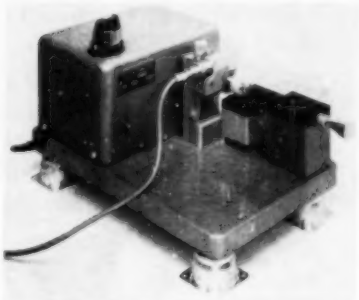
★ ★ ★



P-2-5—Designed to measure distances in the 0 to 45,000 micro-inch range with very high accuracy, the new Electronic Micrometer, Type B-721 affords an unusual method of measuring small distances without physical contact. Measurement is by means of a transformer coupled bridge in conjunction with a non-contacting probe. The distance is measured in terms of the capacitance change between the test surface and the non-contacting probe. This Wayne Kerr Instrument is particularly suited to measurements on rotating objects and for monitoring distance with reference to a predetermined value. Because no physical contact is necessary, accurate determinations of temperature coefficient, moduli of elasticity, rigidity and bulk, Poisson's ratio, and dilation are possible on fragile samples. The standard for the bridge circuit is a three-terminal capacitor whose value is adjusted by a micrometer. The range covered by a particular probe is determined by the area of its end-surface, which is arranged to produce an accurate ratio with the standard micrometer capacitor plates. The micrometer scale is then magnified by the ratio of these two areas. The measured distance is given directly from the micrometer scale, thereby maintaining the normal reading precision associated with a micrometer. With the three terminal arrangement on this Electronic Micrometer, the capacitance of the probe cable can be counteracted, enabling measurements to be made remote from the bridge whenever lack of space or safety considerations preclude the presence of an operator. The probe is unaffected by strong, external magnetic fields.

★ ★ ★

P-2-6—The new RJ Ball Pilotor provides for accurate measurement of surface roughness on all types of balls from 1/16 inch to 1½ inch diameter. This wide range is possible through the use of only eight separate ball adaptors. Hoppers for fast production checking are available for use with the pilotor if required. A variable speed drive has been installed to assure a constant and correct surface speed required for accurate measurement of varying diameter balls. Each Pilotor comes equipped with a specially designed bracket for holding a standard MA Tracer. Standard Profilometer Amplimeters of the types QA and QC are suitable for use with the New Pilotor. All equipment is



portable and can be carried from place to place about the plant and set up in any convenient location wherever there is a production checking job to do.

★ ★ ★

P-2-7—A device providing an accurately adjustable source of infrared radiation, the Model PE521-1 is a controlled Black Body Reference Standard. The sensitivity of infrared detectors and infrared systems can be obtained from a known black body source to determine remote target temperature and emissivity. Constructed as two separate units—the source and the controller—the Perkin-Elmer Model PE521-1 can be used as a secondary standard of radiant energy either by comparison with a primary source or by auxiliary temperature measurement of the conical radiating cavity. The new unit is a closed loop servo system which senses the temperature of the radiating core by means of a platinum resistance thermometer and maintains

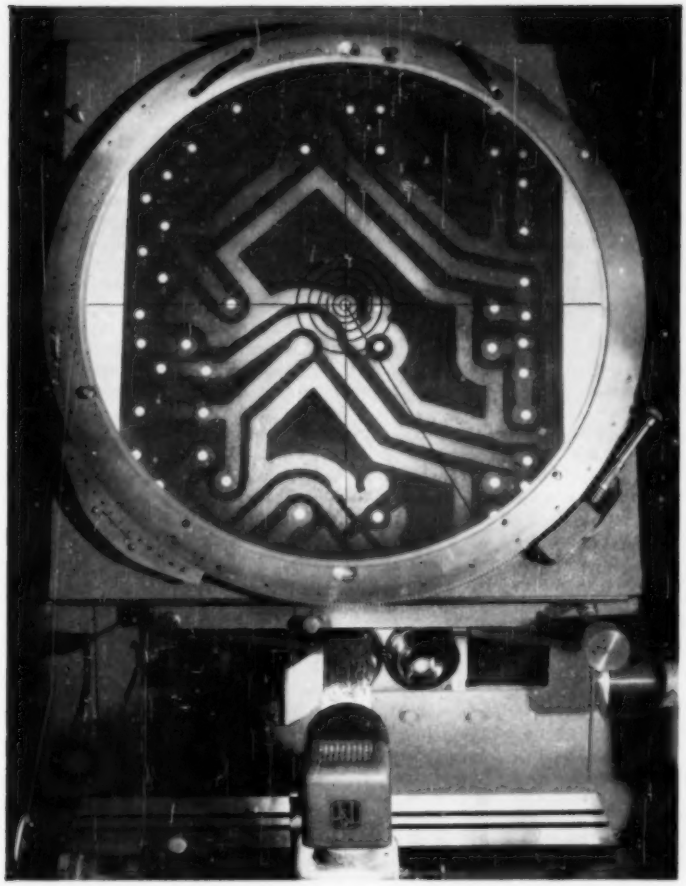
USE A QUINCUNX . . . . . .
to make your quality talk more forceful
to make your in-plant training course more effective

The Quincunx is a must for presentation of basic quality control principles. Demonstrates visually to your audience how a Normal Distribution pattern is formed. Also demonstrates how various Non-Normal distributions are formed.

Lightning Calculator Co.
Box 6192
St. Petersburg Beach 6, Fla.

Send for Information

Additional information regarding new products or new literature items appearing in the "What's New?" department can be obtained by writing in the key number of the item in the Product Education Service coupon which appears on page 42.



J & L Comparators are ideally suited for inspection of printed circuits — because they provide coordinate measuring facilities corresponding to the method by which circuits are dimensioned.

In mating the printed circuit with other components, it is necessary that the terminal points be located accurately. Also — to assure a uniform flow of current through the connectors, the drilled holes at the terminals must be centralized within the circuitry.

A Comparator, equipped with a surface illuminator, projects a reflected image to a chart having radii and lines. By comparing the image of the drilled holes to the radii on the chart the size and location of the holes may be determined.

True precision like this never comes cheap!

Of all the possible areas in which to economize, quality inspection is the least promising. Why?

Simply because the kind of intensive research, painstaking engineering and top-quality manufacture it takes to produce precision inspection equipment like the J&L Comparator just CAN'T be offered at bargain-basement prices. On the other hand, cheap equipment doesn't belong in the same league with a J&L Comparator when it comes to accuracy, speed, versatility and all-round dependability. When it comes to true precision of inspection, a cheap comparator can prove to be *terribly* expensive.

J&L Comparators come in 11 models, both bench and pedestal type.

"The originator of machine tool standards in optical inspection"

JONES & LAMSON

JONES & LAMSON MACHINE COMPANY, Dept. 710, 510 Clinton Street, Springfield, Vt., U.S.A.
Please send me Comparator Catalog 5700, which describes the complete line of J&L Optical Comparators.

name _____ title _____ street _____

company _____ city _____ zone _____ state _____

Model FC-30

ONE MAN BATTLE?

Are you fighting for Quality all alone?

Do your employees think that:

QUALITY is a matter of inspection?

QUALITY is important but not on their jobs?

QUALITY is someone else's responsibiilty?

IF these are some of your plant problems then you will be vitally interested in the Elliott VISUAL QUALITY Program.

ELLIOTT SERVICE COMPANY, INC.
Mount Vernon, New York
(see opposite page →)

this temperature by proportional control. Temperature ranges from 200 degrees to 600 degrees C. The source temperature is set by means of a front panel vernier dial, and an individual calibration curve of dial divisions versus temperature is supplied with each unit. Controlled source temperature is essentially independent of changes in line voltage and ambient temperature and can be precisely reset. A ten foot cable connects the source and controller units allowing for convenient placement of the controller while satisfying special source position requirement. Aperature plates, supplied with the units, are accurately made to close tolerances. Behind the aperature is a pure silver core with a conically shaped radiating cavity. The high thermal conductivity of silver assures uniform surfaces temperature and the conular cavity coated with a temperature resistant black finish has an emissivity approaching unity which will not change as a function of time. Temperature stability of the unit is ± 1½ degrees C. for ambient temperature variations from 16 degrees C. to 38 degrees C. and line voltage variations from 105 volts to 125 volts. The source unit is 3½ inches long by 4⅜ inches high and weighs 1 pound 12 ounces. Cosine radiation distribution is achieved over a 20 degree field of view for the standard aperatures of 0.040 inch or 0.015 inch diameter. The controller is supplied housed in either an 11 inch by 8 inch by 9 inch drawn aluminum cabinet or a 3½ inch relay rack panel. The unit weighs 10 pounds and has a power consumption of 300 watts max. The controller contains no relays or mechanical contacts of any kind to get dirty or wear.

★ ★ ★

P-3-1—The Gardner Automatic Skip Meter was designed originally for a leading manufacturer of paper products for detecting "skip" on paperboard. The exposure head consists of a light source, sensing photocell, microammeter, relays and control switches. This exposure head, approximately 6 × 6 × 3 inches, is mounted directly over the moving web of paperboard, and is capable of providing continuous monitoring on the production line. There is no need for anyone to check the paperboard visually for "skips" (shade differences ranging from light to dark) or other visual imperfections. The automatic Skip Meter can be modified slightly, as needed, to provide continuous quality control on a number of other products similar to a moving web of paperboard or on a conveyor belt. It is therefore useful in controlling color, color brightness, gloss, haze and turbidity, and in detecting misalignment of revolving rolls. It can also detect smoke. By means of relays, the Gardner Automatic Skip Meter will automatically ring a bell, light a lamp, mark the surface, or stop the machinery whenever pre-established tolerance limits are exceeded. The Skip Meter is best used as a Go-No-Go detection unit for monitoring any product or process that provides optical contrast.

Electronic Division News

5th National Symposium, RQC

A total of 1117 attended the 5th National Symposium on Reliability and QC in Electronics held Jan. 12-14 at the Bellevue-Stratford in Philadelphia. This year's Symposium was truly an international event with attendees from Canada, England, Netherlands, Russia, the Swedish and Iranian Embassies, and the Polish Trade Commission, as well as the U.S.

6th National Symposium, RQC

Plans are already underway for next year's symposium which will be back in Washington, D. C. The general theme will be "Product Assurance and Control." C. M. Ryerson, this year's vice chairman, will be general chairman of the symposium. The official call for papers will be made within the next few months. Do you have a paper that you would like to offer, or do you know someone who has an interesting story to tell. It's not too soon to begin thinking of possible papers and speakers for this event.

Reliability Assurance Training Conference

A final outline of the course material to be presented has been prepared. Authors who had previously submitted outlines of portions of the course were requested to submit preliminary rough draft material. The course will be arranged in chronological order emphasizing the specific control measures necessary from product inception, through development, production, and service life. Steps are now being taken by the committee to secure qualified instructors for the course which is tentatively planned for October, 1959.

Production and Field Reliability Handbook

The Reliability Handbook is now available at $2.75 for Division Members; $3.50 for others. (See advertisement and order coupon on page 22 of this issue.)

Chairman of the Board

I. W. Schoeninger, Centralab Division of Globe Union and currently Division Chairman, was recently honored by being elected chairman of the board of directors of the National Symposium on Reliability and Quality Control. His term will run to January 31, 1960.

P-3-2—Designed to meet the needs of plastics production and research programs, the new "Plastics" Plastograph offers a low cost method of color matching; color and filler mixing; lubrication, antioxidant and antistatic studies; polymer stability analysis, and determination of graft sites and molecular weights. The "Plastics" Plastograph is available with special mixing blades which are suitable for all the newest materials and their elevated temperatures. Flow index values, rheological studies, prediction of flow performance, and other research and quality control tests can be made under production conditions. Phonograph record compounds may be accurately mixed and batch uniformity tested with high repetitive accuracy.

★ ★ ★

P-3-3—The Hamilton Kwik-Chek line has been expanded to include seven new measuring tools. Three of these precision gages are now ready for sale and four more will be put on the market in June. Heading the list of the new Kwik-Chek instruments is a Precision Dial Comparator which incorporates the following features: direct reading in 0.00005 inches; range of 0.004 inches; fully jeweled and shock-resistant; dual gaging contact pressure and fine adjustment on both stand and gage. The other two current additions to the line are a Dial Comparator (without fine adjustment) and a Micro Dial Indicator Gage. The additional Kwik-Chek measuring instruments to be available in June are an Indicating Micrometer, a Small Bore Gage, a Horizontal Jaw Gage and a Recess Depth Measurement Gage. All of these utilize the same precision dial indicator gage. The Kwik-Chek Micro Dial Indicator Gage alone is priced at $50 and the Kwik-Chek Precision Dial Comparator with a vertical range of 4 inches and an overall height of 8.5 inches is priced at $110.

★ ★ ★

P-3-4—The Manostat Microtitrator, allowing easy, accurate titration of such small quantities as a single drop, has just been announced. The Microtitrator is a modification of the Gilmont Ultrami-

AROUSE INTEREST!

YOUR COMPANY NAME
when you intercept WASTE DESTROY IT
RELUCTANT WHALE
QUALITY MINDEDNESS is needed for QUALITY PRODUCTION

SECURE COOPERATION!

EMPLOYEE COOPERATION on Quality begins with adequate exposure of the problem.

EMPLOYEE RESPONSE, however, can range from passive resistance to enthusiastic participation. And the stakes are high!

IT MAKES SENSE then to use all the known power and persuasion of in-plant advertising to move minds in the right direction.

THE ELLIOTT VISUAL QUALITY Program can be of real assistance. Through daily employee contacts at the work level it delivers and redelivers your messages.

ITS MOTIVATING INFLUENCE will be felt throughout the plant and particularly in problem areas.

ROUND THE CLOCK support for your Quality objectives could begin with your request for more detailed information on the coupon below.

Elliott Service Company, Inc., Mount Vernon, New York

Elliott Service Company, Inc.
Department 4
Mount Vernon, N. Y.

Please provide me, without obligation, further information and multi-color samples of your Visual Quality Program.

Firm _____

Name _____

Address _____

City _____ Zone _____ State _____

croburet and employs new Beckman Microelectrodes to overcome the limitations inherent in previous methods of titration, where larger quantities were required. Because this new apparatus performs microtitration electrometrically, it eliminates the uncertainty that was involved in visual adjustment and detecting of the end point. The Manostat Microtitrator is capable of both oxidation-reduction and acidimetry-alkalimetry titrations. The apparatus comes complete with special electrodes for each process, and fully equipped with all accessories and solutions. The only other equipment needed is a high-impedance, stable zero, pH meter, such as the Beckman Zeromatic.

★ ★ ★

P-3-5—Designed specifically for use with its line of Cycloptic Steroscopic Microscopes, the A.O. Stereocamera attachment consists of a 35 mm Graflex Stereocamera and an adapter with a special prism compensating system. The adapter attaches directly to the microscope stand and permits the camera to be swung into and out of position over the eyepieces. The camera shoots the sharp, three-dimensional image exactly as it is seen through the microscope—no matter what gross specimen is used—as the prism compensating system of the adapter renders the camera parfocal with the optical system of the microscope. Actual camera technique is simple, and involves no time-consuming manipulations. The shutter is snapped with a cable release as soon as the camera is swung into proper position over the eyepieces. It is a matter of seconds between focusing the specimen and exposing the film. The Stereocamera accepts standard 35mm film, either black-and-white or color. This Stereocamera attachment combines with the Cycloptic Microscope to provide a rigid, compact photomicrographic unit permitting almost limitless possibilities for stereophotomicrography in Industry, Research, Education. . . . in fact, wherever the Cycloptic Microscope is used and it is desirable to obtain permanent 3-D photographic records of a specimen.

★ ★ ★

P-3-6—Arrangements for the import of a new type swing jaw caliper from Switzerland that allows for measurement between points located on different axes has been announced by The American And Overseas Trading Co. The new caliper is a swing jaw type perfected by a Swiss designer in Geneva to meet the need for a faster method of measuring precision machined parts without losing accuracy. The primary feature of the caliper is the swing jaw which has a hinge that allows it to rotate a full 180 degrees in a plane parallel to the measuring surface of the jaws. This makes it possible to measure distances between two points situated on different axes and eliminates the necessity of using height gages. Permanent accuracy has been assured for the hinge by its design. Applications for this caliper can be found in most instances where an ordinary caliper and height gage were formerly used. The vernier scale may be read to 0.001 inches and in addition there is an angular measuring scale located on the pivot point of the lower jaw for checking angles between various axes. The caliper is constructed of stainless hardened steel and needs only a minimum of care to assure long and accurate use. A protective wooden case is provided for the caliper when it is not in use. The most popular size is the 10 inch size caliper which sells for $79. Other sizes range in price from $39.

★ ★ ★

P-3-7—A new monochramatic light source known as the Cartrilamp has been recently introduced Completely portable and self-contained in a specially designed carrying case, the unit is protected against damage. It is used in conjunction with the new, coated Cartriflats. An exclusive feature of the Cartrilamp is the placing of the work on top of the flat, instead of beneath the flat. This feature eliminates much of the waste motion required by placing a loose flat over the work. With a 10 inch diameter Cartriflat fixed in position, the work is placed on the flat and a look into the viewing mirror quickly completes the inspection. Fixed position of the flat avoids needless handling and possible damage to the flat. With the 10 inch flat, many small parts may be placed on the surface and inspected

simultaneously, eliminating the need to switch to smaller flats for checking smaller parts. No lamp adjustments are required as the lamp is factory set for correct viewing with flat in fixed position. The large bright working field eliminates the necessity of exact placement of the work for proper illumination. The Cartriflat surface is specially treated with a high-efficiency coating which increases the reflectivity in some areas and decreases it in others. It also concentrates and intensifies the helium light on the work surface. As a result, interference bands are projected with brilliance and clarity. The bright, well-defined bands are easily read even on dull-lapped parts such as brass and soft steel. Since bands can readily be seen through an appreciable air gap at various distances, rubbing or pressing down the flat to reduce the air gap is eliminated, thus scratching and wear is minimized, and the life of the optical flat is increased. The viewing mirror is located inside the cabinet where it is shielded from glare of outside light. Cartriflats with center holes for inspecting shoulders on extended shafts are also available.

★ ★ ★

P-3-8—Extra long measuring range is now available with the addition of Model E8IU to the Federal line of Dial Indicators. Specifically designed for use in measuring slide travel, cam throw, etc., this new model has a total range of 3 inches and is graduated in 0.001 inch. To enable quick reading anywhere in the total span of 30 revolutions, Model E8IU is equipped with two counter dials. One is divided into ten segments of 0.100 inches each to count individual revolutions. The other is divided in inches Construction of the E8IU is similar to that of regular Federal Indicators except for increased length of stem, spindle and dust cap to allow for the much greater distance of spindle travel. The Indicator has a Full-Jeweled, Low-Friction movement and adjustable bezel. It is normally furnished with a vertical central bracket and continuous clockwise dial. Like regular Indicators, however, it can be used with a number of other readily available backs and contacts. Balanced or continuous counter clockwise dials may be specified for use with Model E8IU at no additional cost.

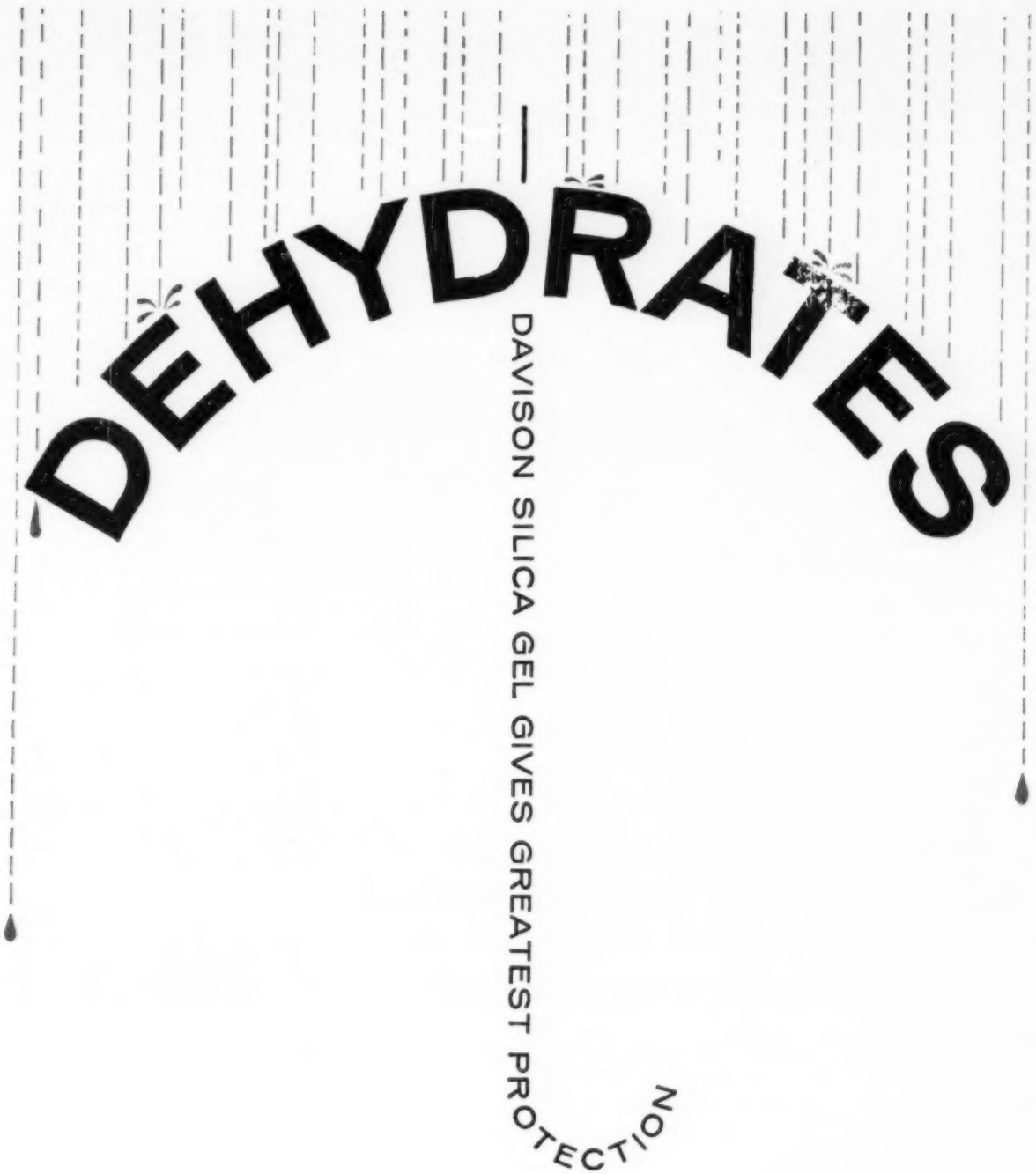
(Continued on page 22)

20-FACE DICE . . .
for generating
random numbers

These dice come in handy when you want to generate numbers in a most impartial way. Each die is a regular icosahedron and has numbers 0 to 9 engraved twice each on its faces. By throwing this die numbers from 0 to 9 appear with equal probability. The dice come in a set of 3 colors.

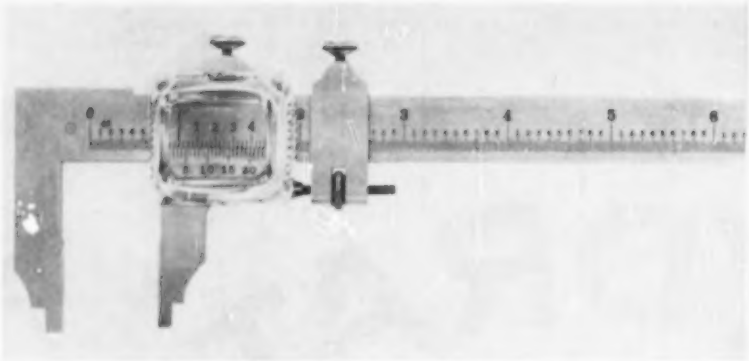
Price : $ 2.50
Postage : $ .70 (up to 9 sets)
To be paid in advance by Demand Draft payable in Tokyo.

JAPANESE STANDARDS ASSOCIATION
6-1, Ginza-higashi, Chuo-ku,
Tokyo, Japan



One cubic inch of Davison Silica Gel has an adsorptive surface of 90,000 square feet—an area larger than two city blocks! This capacity has made Davison Silica Gel the favored desiccant for air and gas dehydration and wherever rust, corrosion, or other moisture problems exist. For instance, Davison desiccants are used to protect tropical shipments, to clean and dehydrate air and natural gas—refrigeration systems—blast furnace gases—and in oxygen plants. Perhaps the application of a Davison desiccant to *your* moisture problems is in order. Write Department 3424 or call today for complete information.

W.R. GRACE & CO.
DAVISON CHEMICAL DIVISION
BALTIMORE 3, MARYLAND



P-3-10—Increased accuracy in reading all vernier scales is now possible with a new Bausch & Lomb Vernier Magnifier. The instrument has application for machinists, engineers, toolmakers, inspectors, and home workshop enthusiasts who use vernier scales. The clear plastic body of the magnifier is designed to admit available room light. Two permanent alnico magnets are embedded in the base for attaching to metal scales. The magnifier provides clear, sharp enlargement of scale lines for easier, more exact readings. The price is $2.50 each.

★ ★ ★

P-3-9—The first transistor tester capable of checking the performance of transistors while they are connected within their circuit, is now being produced by Philco Corp. A contract to build more than 900 transistor testers has been awarded to Philco as a result of a previous Navy contract, under which Philco design engineers developed an unique combination of transistor circuits which resulted in this technical breakthrough —an in-circuit transistor tester. Philco has announced that a commercial model of its new transistorized transistor tester will be available in the near future. In-circuit transistor testing is extremely important since the method saves trouble shooting and servicing time without turning on power in the equipment. Other transistor testers cannot perform in-circuit measurements since they are unable to differentiate between normal input and output signals generated by the transistor and spurious signals appearing at either the input or output terminals. These spurious signals arise from the sneak paths propagated by the circuitry surrounding the transistor under test. Low impedance methods are employed in both the input and output circuits to nullify the effects of the external circuitry.

New Literature Available

L-2-5—Challenge Machinery Co. has published a new descriptive catalog with prices covering over 300 standard items of precision surface equipment. Included are both Semi-Steel and Granite Surface Plates, Semi-Steel Angle Plates, V-Blocks, Box Parallels, Straight Edges, Bench Plates, Welding Tables, Heavy Duty Work Benches, Layout Plates, Lapping Plates and similar equipment.

♦ ♦ ♦

L-2-6—A new sixteen page guide to whiteprint equipment and their various applications is offered free of charge by the Ozalid Division of General Aniline and Film Corp. This booklet includes product photos of the latest equipment and a list of complete specifications for each model. In addition, each model is fully described in terms of its particular advantages, applications and distinguishing features. Detailed data is furnished on the Bambino, Osamatic, Streamliner and Printmaster.

♦ ♦ ♦

L-2-7—The selection of columns for analysis of liquids and gases by gas chromatography will be easier for the chemist who has a copy of a new application data sheet just published by Beckman applications laboratories. The data sheet, GC-90-M1, lists the characteristics of 22 chromatographic columns along with their important applications and includes 28 chromatograms demonstrating actual column performance.

♦ ♦ ♦

L-3-1—A line of Temperature Indicators, Controllers and Transmitters featuring corrosion-proof fiber glass cases and suitable for temperatures ranging from —400 to + 1000F is described in a series of five new Specification Sheets 12-1451T-1 to 5 available free from Fischer & Porter.

♦ ♦ ♦

The Malleable Research and Development Foundation Granville, Ohio has made available free to anyone responsible for materials specification or selection, a 76 page Handbook furnishing an introduction to Pearlitic Malleable, as well as a ready reference to the latest information and data on this relatively new material. Four chapters cover introduction to the material, castings, facts and figures for design, and applications. Three charts contain all information necessary to translate basic design needs into final pearlitic malleable specifications. Ten tables, 19 charts, and 14 illustrations are included.

♦ ♦ ♦

L-3-2—A fourteen page booklet which fully describes and illustrates three com-

(Concluded on page 31)

AVAILABLE NOW . . . Your Copy of
Production and Field Reliability Handbook

Edited by the

Technical Publications Committee of the Electronics Division of the American Society for Quality Control

Begins with basic reliability principles and theory, progresses logically through reliability and quality controls applied during the sequential steps of production and field use.

TABLE OF CONTENTS

1. Reliability Concepts
2. Terms & Definitions
3. Reliability Mathematics
4. Supplier Controls
5. Supplier Rating
6. Receiving Inspection and Test
7. Process Controls
8. Unit & System Tests
9. Maintenance Aspects
10. Field Failure Reporting
11. Field Failure Analysis
12. Field Evaluation

J. Bemersderfer, Electronics Division Treas.
General Electric Co., Building 500, Cincinnati 15, Ohio

Send me ..... copies of the Production and Field Reliability Manual at $3.50 per copy. $2.75 per copy for Electronics Division members.

Amount ..... enclosed.

Name .....

Address .....

Make all checks payable to the Electronics Div., ASQC.

Now... DoALL BLACK GRANITE SURFACE PLATES

are available in

• THREE ACCURACIES

Laboratory Grade (AA) ..... .000025"
Inspection Grade (A) ..... .000050"
Shop Grade (B) ..... .000100"

Available in the fine area accuracies shown above and to over-all accuracies from .000050" to .004". You can buy the exact grade needed, with or without ledges, to meet your requirements.

• MORE SIZES

Heavier demands and expanded production now enable DoALL to supply black granite plates in over 400 combinations of sizes, ledges and accuracies.

DoALL surface plates are made from the finest black granite available. Comparative tests rank it highest in compression strength, density and weight, and lowest in absorption and porosity. DoALL's black granite is extremely dense, rigid, fine-grained, and hard enough to be used for cutting and polishing ordinary granites.

Using the best of all granites, DoALL's master gage makers, metrologists and quality control engineers pool their know-how to manufacture the very finest surface plates. The result: a complete line of surface plates of guaranteed accuracy.

WRITE FOR NEW CATALOG

The sizes, designs and specifications of DoALL's complete line of black granite surface plates and accessories are shown in a new free catalog. Write for your copy today. Or call your local DoALL Sales-Service Store and ask for a DoALL Engineer to recommend the black granite products best suited to your production and inspection needs. His expert advice is free.

DoALL ECONOMY SPECIAL

DoALL Black Granite TOOLMAKERS' FLAT

Here is the handy, inexpensive yet accurate foundation to be used by your machinists, toolmakers, diemakers, assemblers and many others.

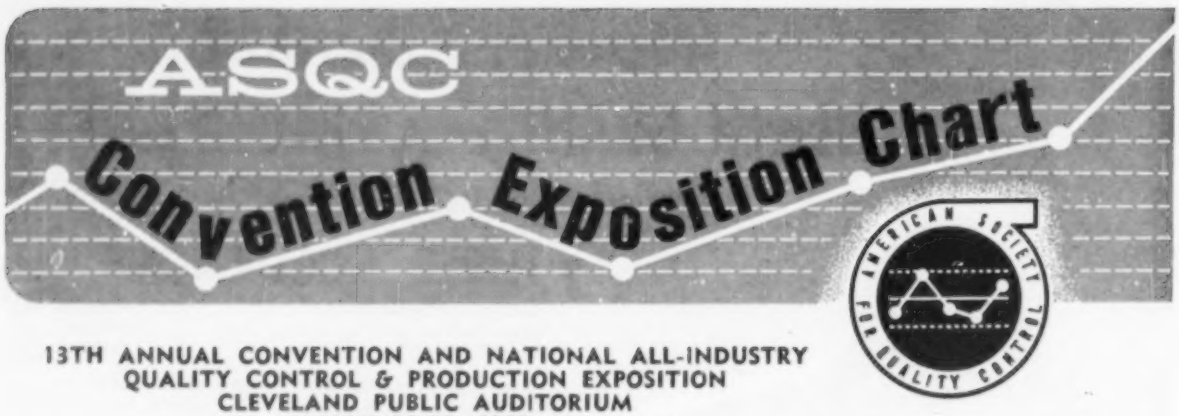
Size: 8" x 12" x 2"
Accuracy: .0002" over-all
Regularly a $22.00 value

ONLY $19.50

BG-3

THIS IS A TYPICAL DoALL STORE

The DoALL Company, Des Plaines, Illinois



13TH ANNUAL CONVENTION AND NATIONAL ALL-INDUSTRY QUALITY CONTROL & PRODUCTION EXPOSITION
CLEVELAND PUBLIC AUDITORIUM
MAY 25-27, 1959

Committee Meetings Schedule

(All meetings at Hotel Sheraton–Cleveland, except ASQC Annual Meeting)

TIME	*DATE & MEETING*	*ROOM*
	SUNDAY, MAY 24	
10:00 am	General Technical Council	Terminal Room
8:00 pm	Education & Training Committee	D.R. 1
	MONDAY, MAY 25	
7:30 am	Breakfast	
	Saddoris Award Committee	D.R. 9
9:00 am	Division & Technical Committee Chairmen	D.R. 1
	Professional Services Committee Chairmen	D.R. 3
	Constitution & By-Laws Committee	D.R. 5
	Bibliography Committee	D.R. 7
	Committee on Professional Development	D.R. 9
	Inspection Technical Committee	East Room
3:00 pm	Committee on Relations with Professional Societies	D.R. 1
	Reliability Technical Committee	D.R. 3
	Foods Steering Committee	D.R. 5
4:15 pm	ASQC ANNUAL MEETING (Public Auditorium)	Club "B"
6:00 pm to 9:00 pm	Administrative Applications Division	D.R. 1
	Aircraft & Missile Division	D.R. 3
	Automotive Division	D.R. 5
	Chemical Division	D.R. 7
	Textile Division	D.R. 9
	Electronics Division	East Room
	Metals Technical Committee	Terminal Room
7:30 pm	Section Officers	Rose Room
	TUESDAY, MAY 26	
8:00 am	Awards Committee	D.R. 1
9:00 am	Auditing Committee	D.R. 3
	Brumbaugh Award Committee	D.R. 5
	Examining Committee	D.R. 7
	District Representatives	D.R. 9
	Publicity & Promotion Committee	East Room
3:00 pm	**Board of Directors—New**	Terminal Room
	Standards Committee	D.R. 1
	Committee on International Cooperation	D.R. 3
	Applied Methodology Committee	D.R. 5
	Committee on Professional Ethics and Qualifications	D.R. 7
	Vendor-Vendee Steering Committee	D.R. 9
	Research & Development Technical Committee	East Room
	Award Fund Committee	Directors
9:30 pm	Editorial Board	D.R. 1
	Shewhart Medal Committee	D.R. 3
	Real Estate Committee	D.R. 5
	Financial Advisory Committee	W. R. W.
	WEDNESDAY, MAY 27	
8:00 am	Publications Committee	D.R. 1
9:00 am	Brewing Steering Committee	D.R. 3
	Program & Speakers Committee	D.R. 5
	Conferences Committee	D.R. 7
	IQC Advertising Committee	D.R. 9
	IQC Editorial Committee	East Room
3:00 pm	**Board of Directors—Old**	Terminal Room
	THURSDAY, MAY 28	
9:00 am	Operating & Executive Committees	Terminal Room
	General Convention Committee	D.R. 1

MONDAY, MAY 25, 1959

9:30-10:30 A. M.

D EDUCATION AND TRAINING

Speaker: JOSEPH MOVSHIN, Ramsey Corporation, Manchester, Missouri
Subject: **"Experimental Designs and Analysis of Variance"**
Moderator: DAVID S. CHAMBERS, University of Tennessee, Knoxville, Tennessee

E CHEMICAL

Speaker: ARTHUR JOHNSON, Buckeye Cellulose Corporation, Memphis, Tenn.
Subject: **"Sensitivity and Efficiency of Experimental Design"**
Moderator: J. STUART HUNTER, Princeton University, Princeton, New Jersey

10:00-11:00 A.M.

F METALS TECHNICAL

Speaker: STANLEY J. HOTCHNER, American Can Company, San Francisco, Calif.
Subject: **"Control of Quality of Sheet Metal for Containers"**
Moderator: JOHN V. STURTEVANT, United States Steel Corporation, Pittsburgh, Pennsylvania

G ADMINISTRATIVE APPLICATIONS

Speaker: JAMES L. LUNDY, Josten Manufacturing Company, Owatonna, Minnesota
Subject: **"An Industrial Engineer Looks at Statistical Controls"**
Moderator: GAYLE W. McELRATH, University of Minnesota, Minneapolis, Minn.

10:15-11:15 A.M.

A GENERAL INTEREST

Speaker: J. N. BERRETTONI, Quality Control Consultant, Cleveland, Ohio
Subject: **"Quality Control in Rubber Manufacturing"**
Moderator: V. P. CAMPANELLA, Thompson Ramo Wooldridge, Inc., Cleveland, Ohio

B ARMED SERVICES

Speakers: JOE C. SCHNEIDER, Department of the Air Force, Wright-Patterson Air Force Base, Ohio
ELDON A. KOERNER, Department of the Army, Washington, D.C.
GEORGE L. HEAP, Department of the Navy, Washington, D.C.

ARMED SERVICE (Cont'd)

Subject: **"Military Progress in Quality Control for 1958"**
Moderator: JOHN J. RIORDAN, Defense Department, Washington, D.C.

C BREWING

Speakers: N. L. SCHLEIFER and HAROLD E. WEISSLER, Falstaff Brewing Corporation, St. Louis, Missouri
Subject: **"Theoretical and Practical Applications of Statistics to Control of Can Beer Air"**
Moderator: JOHN S. RANDALL, Anheuser Busch, Inc., St. Louis, Missouri

10:45-11:45 A.M.

D EDUCATION & TRAINING

Speaker: MAX ASTRACHAN, Air Force Institute of Technology, Wright-Patterson Air Force Base, Ohio
Subject: **"Experimental Designs and Analysis of Variance"**
Moderator: ROBERT W. BOEKE, John Deere Company, Moline, Illinois

E CHEMICAL

Speaker: W. J. YOUDEN, National Bureau of Standards, Washington, D.C.
Subject: **"Problems of an Experimenter"**
Moderator: VICTOR B. SHELBURNE, Carborundum Company, Niagara Falls, N. Y.

11:15 A.M. - 12:15 P.M.

F AUTOMOTIVE

Speaker: JOHN A. FOURNIER, Ford Motor Company, Allen Park, Michigan
Subject: **"Ford Quality Audit System"**
Moderator: LEO J. NARTKER, Delco Products, Dayton, Ohio

G ADMINISTRATIVE APPLICATIONS

Speaker: ANDREW R. RODGER, JR., International Latex Corporation, Dover, New Jersey
Subject: **"Production Control"**
Moderator: ALLIN P. DEACON, Quality Control Consultant, Brantford, Ontario

3:00-4:00 P.M.

A GENERAL INTEREST

Speaker: RICHARD W. WALLEN, Personnel Research & Development Corporation, Cleveland, Ohio
Subject: **"Human Relation Problems in Statistical Quality Control"**
Moderator: CHARLES H. JOSEPH, JR., The World Publishing Company, Cleveland, Ohio

B OPERATIONS RESEARCH

Speaker: BLAIR E. OLMSTEAD, Prudential Insurance Company, Newark, N. J.
Subject: **"Queuing Applied to an Access Problem"**
Moderator: HOWARD L. JONES, University of Chicago, Chicago, Illinois

C APPLIED METHODOLOGY

Speaker: GEORGE E. P. BOX, Princeton University, Princeton, New Jersey
Subject: **"Fitting Theoretical Response Surfaces"**
Moderator: ACHESON J. DUNCAN, Johns Hopkins University, Baltimore, Maryland

D FOOD

Speaker: HOWARD L. STIER, National Canners Association, Washington, D.C.
Subject: **"How Statistical Quality Control Is Used in Food Processing Industries"**
Moderator: LEWIS W. BEEM, Gerber Products Company, Rochester, New York

4:15-5:15 P.M.

A GENERAL INTEREST

Speaker: DAVID FRAZIER, Standard Oil Company of Ohio, Cleveland, Ohio
Subject: **"Quality Control Applications in Oil Refining Field"**
Moderator: MARTIN A. BRUMBAUGH, Bristol Laboratories, Inc., Syracuse, N. Y.

B OPERATIONS RESEARCH

Speaker: ROBERT E. JOHNSON, Western Electric Company, New York, N. Y.
Subject: **"Use of Operations Research in Western Electric Company"**
Moderator: HOWARD L. JONES, University of Chicago, Chicago, Illinois

C APPLIED METHODOLOGY

Speaker: LEO A. AROIAN, Hughes Aircraft Company, Culver City, California
Subject: **"Go-No-Go Gages for Process Controls Vs X and R Charts"**
Moderator: PAUL C. CLIFFORD, Montclair State Teachers College, Montclair, New Jersey

D FOOD

Speaker: AMIHUD KRAMER, University of Maryland, College Park, Maryland
Subject: **"Food Processing Decisions by Multifactor Analysis"**
Moderator: LEWIS W. BEEM, Gerber Products Company, Rochester, New York

2:30-4:00 P.M. • PANEL SESSIONS

1 INSPECTION

Panel: DANIEL G. MECKLEY III, The Tappan Stove Company, Mansfield, Ohio
HARRY D. GREINER, The Budd Company, Philadelphia, Pennsylvania
Subject: **"Inspection"**
Moderator: STANLEY B. SHERWOOD, General Motors Corporation, Detroit, Michigan

2 PROCESS CONTROL OF CONTINUOUSLY EXTENDED PRODUCT

Panel: FREDERICK C. HARTWELL, Peter J. Schweitzer Div., Kimberly Clark Corporation, Lee, Massachusetts
W. P. GOEPFERT, Aluminum Company of America, Pittsburgh, Pennsylvania
DORSEY E. DEAN, The Martin Company, Cocoa, Florida
CHARLES D. FERRIS, Mohasco Industries Inc., Amsterdam, New York
Subject: **"Process Control of Continuously Extended Product, Such as Wire, Strip, Foil, Rubber, Paper, Plastic, Aluminum"**
Moderator: ROCCO L. FIASCHETTI, Ansco General Aniline & Film Corporation, Binghamton, New York

2:30 P.M. • PLANT VISITATIONS

1—FORD
2—SOHIO
3—ALCOA

Convention Program

TUESDAY, MAY 26, 1959

9:00-10:00 A.M.

A GENERAL INTEREST

Speaker: RUSSELL L. ACKOFF, Case Institute of Technology, Cleveland, Ohio
Subject: **"Operations Research"**
Moderator: PAUL S. OLMSTEAD, Bell Telephone Laboratories, Whippany, New Jersey

B ARMED SERVICES

Speakers: RICHARD P. BARTLETT, U. S. Department of Agriculture, Washington, D.C.
ELWIN R. PRATHER, Department of the Army, Washington, D.C.
GORDON J. KEEFE, Department of the Army, Washington, D.C.
Subject: **"New Developments in Military Food Inspection"**
Chairman: RICHARD L. LEWIS, Military Subsistence Supply Agency, Chicago, Illinois.

C PROFESSIONALISM IN QUALITY CONTROL

Speaker: A. V. FEIGENBAUM, General Electric Company, New York, N. Y.
Subject: **"Total Quality Control"**
Speaker: LEON BASS, General Electric Company, Cincinnati, Ohio
Subject: **"What A.S.Q.C. Is Doing for the Quality Control Engineer"**
Moderator: MASON E. WESCOTT, Rutgers University, New Brunswick, N. J.

9:30-10:30 A.M.

D EDUCATION AND TRAINING

Speaker: FRED C. LEONE, Case Institute of Technology, Cleveland, Ohio
Subject: **"Experimental Designs and Analysis of Variance"**
Moderator: MILTON E. TERRY, Bell Telephone Laboratories, Murray Hill, N. J.

E MANUFACTURING AND ASSEMBLY

Speaker: HARRY G. HARDING, International Business Machines Corporation, Kingston, New York
Subject: **"Vendor Quality Rating"**
Moderator: WILLIAM BOBALKE, Federal Bearing Company, Inc., Poughkeepsie, New York

10:00-11:00 A.M.

F METALS TECHNICAL

Speaker: WILLIAM M. BERTHOLF, Colorado Fuel & Iron Corporation, Pueblo, Colorado
Subject: **"Bulk Sampling"**
Moderator: PHILIP HERMANN, Jones & Laughlin Steel Corporation, Pittsburgh, Pennsylvania

10:15-11:15 A.M.

GENERAL INTEREST

Speaker: ALBERT S. CAHN, The Rand Corporation, Santa Monica, California
Subject: **"Reliability, Quality Control, and Simulation"**
Moderator: STEPHEN C. BATES, Bell Telephone Laboratories, Cleveland, Ohio

AIRCRAFT

Speaker: PAUL E. ALLEN, Beech Aircraft Corporation, Wichita, Kansas
Subject: **"Evaluating Inspection Costs"**
Moderator: RALPH D. HUMPHRIES, Cessna Aircraft Corporation, Wichita, Kans.

10:45-11:45 A.M.

D EDUCATION AND TRAINING

Speaker: GAYLE W. McELRATH, University of Minnesota, Minneapolis, Minn.
Subject: **"Experimental Designs and Analysis of Variance"**
Moderator: CHARLES R. HICKS, Purdue University, Lafayette, Indiana

E MANUFACTURING AND ASSEMBLY

Speaker: W. R. DAVISON, Phillips Petroleum Corporation, Bartlesville, Oklahoma
Subject: **"Latent Reliability — An Approximation Method"**
Moderator: FRANK J. SINDELAR, International Business Machines Corporation, Poughkeepsie, New York

11:15 A.M. - 12:15 P.M.

AUTOMOTIVE

Speaker: JOHN R. PARKER, A. O. Smith Corporation, Milwaukee, Wisconsin
Subject: **"The Role of Product Engineering in Automotive Quality"**
Moderator: DALE A. CUE, Hoover Ball Bearing Company, Ann Arbor, Michigan

G ELECTRONICS

Speaker: JOHN H. K. KAO, Cornell University, Ithaca, New York
Subject: **"The Weibull Distribution in Life Testing of Electron Tubes"**
Moderator: HENRY SCHUMER, International Resistance Company, Skyland, N. C.

Speaker: H. F. EPPENSTEIN, Convair Astronautics, San Diego, California
Subject: **"The Management of the Convair Astronautical Reliability Function"**
Moderator: GORDON H. BECKHART, Radio Corporation of America, Moorestown, New Jersey

3:00-4:00 P.M.

A GENERAL INTEREST

Speaker: WILLIAM A. MacCREHAN, Bendix Aviation Corporation, Towson, Md.
Subject: **"The Challenge of Reliability"**
Moderator: BERNARD HECHT, Bernard Hecht & Associates, Los Angeles, Calif.

B ADMINISTRATIVE APPLICATIONS

Speaker: MARVIN E. MUNDEL, Industrial Engineering Consultant, Milwaukee, Wisconsin
Subject: **"Quality Control Techniques in Time Study"**
Moderator: JOHN M. ALLDERIGE, Eastman Kodak Company, Rochester, N. Y.

C ELECTRONICS

Speaker: S. W. ROBERTS, Bell Telephone Laboratories, New York, New York
Subject: **"Zone Test Criteria in Control Charts—Quality Control Characteristics (New Developments)"**
Moderator: J. L. BEMESDERFER, General Electric Company, Cincinnati, Ohio

D ATOMIC POWER

Speaker: DONALD J. GREB, Westinghouse Electric Corporation, Pittsburgh, Pa.
Subject: **"General Quality Problems Encountered in the Naval Nuclear Propulsion Program"**
Moderator: FRANK CAPLAN, JR., Westinghouse Electric Corporation, Blairsville, Pennsylvania

4:15-5:15 P.M.

GENERAL INTEREST

Speaker: GEORGE E. FERRIS, General Foods Corporation, Battle Creek, Mich.
Subject: **"Sensory Testing"**
Moderator: AMIHUD KRAMER, University of Maryland, College Park, Maryland

ADMINISTRATIVE APPLICATIONS

Speaker: D. G. MALCOLM, System Development Corporation, Santa Monica, California
Subject: **"Inventory Control"**
Moderator: SIGMUND P. ZOBEL, Carborundum Company, Niagara Falls, New York

ELECTRONICS

Speaker: JAMES R. KING, Avco Research & Development Division, Wilmington, Mass.
Subject: **"Extreme Value Theory and Its Relation to Reliability Analysis"**
Moderator: DONALD A. IRWIN, Canadian Arsenal Ltd., Toronto, Canada.

ATOMIC POWER

Speaker: CHARLES M. MILLER, Westinghouse Electric Corporation, Pittsburgh, Pennsylvania
Subject: **"Specific Quality Problems in the Manufacture of Components for Nuclear Power Plants"**
Moderator: FRANK CAPLAN, JR., Westinghouse Electric Corporation, Blairsville, Pennsylvania

2:30 P.M. - 4:00 P.M. • PANEL SESSIONS

3 QUALITY CONTROL APPLICATIONS IN THE JOB SHOP

Panel: ROBERT D. MUIR, Lundberg Screw Products, Lansing, Michigan
WARREN E. JONES, Consultant, DesPlaines, Illinois
C. R. KENDEL, Lamson & Sessions, Cleveland, Ohio
JULIUS MEHALEK, The Budd Company, Philadelphia, Pennsylvania
Subject: **"Quality Control Applications in the Job Shop—Heading, Stamping, Plating, Molding, Welding, etc."**
Moderator: HARMON S. BAYER, Consultant, Detroit, Michigan

4 IMPLEMENTING S.Q.C. TECHNIQUES WITH MODERN DATA PROCESSING EQUIPMENT

Panel: MELVIN GREAVES, Arthur G. McKee Company, Cleveland, Ohio
D. S. MACOY, United States Steel Corporation, Gary, Indiana
H. T. OATMAN, Allegheny Ludlum Steel Corporation, Brackenridge, Pennsylvania
PHILIP HERMANN, Jones & Laughlin Steel Company, Pittsburgh, Pennsylvania
JOSEPH BERSTON, Burroughs Corporation, Cleveland, Ohio
ARTHUR J. FLYNN, Remington Rand Univac Center, Chicago, Illinois
JAMES SMILEY, Electronics Associates, Long Branch, New Jersey
MARIO V. MORREALE, I.B.M. Corporation, Poughkeepsie, New York
Subject: **"Implementing S.Q.C. Techniques with Modern Data Processing Equipment"**
Moderator: DOUGLAS H. W. ALLAN, American Iron & Steel Institute, New York, New York

2:30 P.M. • PLANT VISITATIONS

4—LEWIS LAB. 5—REPUBLIC STEEL

Convention Program

WEDNESDAY, MAY 27, 1959

9:00-10:00 A.M.

A GENERAL INTEREST

Speaker: MILTON TERRY, Bell Telephone Laboratories, Murray Hill, N. J.
Subject: **"New Parametric Methods"**
Moderator: J. N. BERRETTONI, Quality Control Consultant, Cleveland, Ohio

B VENDOR - VENDEE

Speaker: KENNETH WARNER, North American Aviation, Downey, California
Subject: **"Benefits of Time Reporting to Producer and Consumer"**
Moderator: WILLIAM E. COX, Northrop Aircraft, Inc., Hawthorne, California

C PROFESSIONALISM IN QUALITY CONTROL

Speaker: DAVID A. HILL, Hughes Aircraft Corporation, Culver City, California
Subject: **"Quality Engineering Applied to Incoming Material"**
Moderator: A. V. FEIGENBAUM, General Electric Company, New York, N. Y.

9:30-10:30 A.M.

D ARMED SERVICES

Speakers: E. J. LANCASTER, U.S. Air Force Ballistic Missiles Office, Inglewood, California.
C. A. HEATH, U.S. Army Ballistic Missile Agency, Huntsville, Alabama
GLENN G. ESTES, JR., United States Navy, McLean, Virginia
Subject: **"Quality Control and Reliability of Military Equipment—Part I"**
Chairman: MAX ASTRACHAN, Air Force Institute of Technology, Wright-Patterson Air Force Base, Ohio

E CHEMICAL

Speaker: GRANT HANEY, JR., General Tire Company, Waco, Texas
Subject: **"Samples for Chemical Process Control"**
Moderator: C. T. SHEWELL, Humble Oil Company, Baytown, Texas

10:00-11:00 A.M.

F METALS TECHNICAL

Speaker: SIGMUND P. ZOBEL, Carborundum Company, Niagara Falls, New York
Subject: **"Foundry Applications"**
Moderator: R. S. RHEA, Tube Manifold Corporation, North Tonawanda, N. Y.

G STANDARDS

Speaker: IRVING W. BURR, Purdue University, Lafayette, Indiana
Subject: **"Standardization of Quality Control Terms and Symbols"**
Moderator: RALPH E. WAREHAM, Consultant, Chappaqua, New York

10:15-11:15 A.M.

A GENERAL INTEREST

Speaker: GEORGE VLASES, JR., Treasury Department, Washington, D.C.
Subject: **"Practical Aspects of Sampling"**
Moderator: HARRY ROMIG, Hoffman Laboratories, Los Angeles, California

B VENDOR - VENDEE

Speaker: WILLIAM C. HANNA, Northrop Aircraft, Inc., Hawthorne, Calif.
Subject: **"Production Vibration Processing—A Report"**
Moderator: JOHN W. YOUNG, North American Aviation Corporation, Los Angeles, Calif.

C PROFESSIONALISM IN QUALITY CONTROL

Speaker: ROBERT SCHIN, Western Electric Company, Allentown, Pennsylvania
Subject: **"Quality Control Engineering in Process and Product Control"**
Speaker: E. G. D. PATTERSON, Bell Telephone Laboratories, New York, New York
Subject: **"Quality Control Engineering in Product Evaluation"**
Moderator: A. V. FEIGENBAUM, General Electric Company, New York, N. Y.

10:45-11:45 A.M.

AIRCRAFT

Speaker: ALBIN N. BENSON, Air Force Missile Test Center, Patrick Air Force Base, Florida
Subject: **"The Reliability Efforts of the Test Engineering Department of the Air Force Missile Test Center"**
Speaker: STEPHEN M. TRUEX, Office of Assistant Secretary of Defense, Washington, D.C.
Subject: **"Missile Data Feedback System"**
Moderator: JOHN G. RUTHERFORD, Lear, Inc., Grand Rapids, Michigan

E CHEMICAL

Speaker: JOHN C. WHITWELL, Princeton University, Princeton, New Jersey
Subject: **"Practical Application of Evolutionary Operation"**
Moderator: MAYNARD S. RENNER, Dewey & Almy Chemical Company, Cambridge, Massachusetts

11:15 A.M. - 12:15 P.M.

AUTOMOTIVE

Speaker: DAVID N. SMITH, Jones & Lamson Machine Company, Springfield, Vt.
Subject: **"Machine Capability — A Tool for Builder and User"**
Moderator: ROBERT D. MUIR, Lundberg Screw Products Company, Lansing, Mich.

G STANDARDS

Speaker: HAROLD F. DODGE, Rutgers University, New Brunswick, N. J.
Subject: **"On Sampling Inspection Plans"**
Moderator: R. BRADFORD MURPHY, Bell Telephone Laboratories, New York, New York

3:00-4:00 P.M.

A BREWING

Speaker: MAE-GOODWIN TARVER, Continental Can Company, Chicago, Illinois
Subject: **"A Q.C. Approach to the Selection of Flavor Panel Members"**
Moderator: JOHN F. STEPHAN, Froedtert Malt Corporation, Milwaukee, Wisconsin

B ARMED SERVICES

Speakers: JOHN J. CROWLEY, Grand Central Rocket Company, Redlands, California
O. C. GRIFFITH, Air Material Command, Wright-Patterson Air Force Base, Ohio
Subject: **"Quality Control and Reliability of Military Equipment, Part II"**
Chairman: MAX ASTRACHAN, Air Force Institute of Technology, Wright-Patterson Air Force Base, Ohio

C APPLIED METHODOLOGY

Speaker: CHARLES R. HICKS, Purdue University, Lafayette, Indiana
Subject: **"Randomized Incomplete Blocks"**
Moderator: FRED C. LEONE, Case Institute of Technology, Cleveland, Ohio

D TEXTILE

Speaker: ROBERT E. HEILAND, Kurtz Salmon Associates, Inc., Washington, D.C.
Subject: **"Continuous Forecast Correction in Planning Apparel Production"**
Moderator: ROBERT G. MITCHELL, International Corporation, Dover, Delaware

2:30-4:00 P.M. • PANEL SESSIONS

5 MANAGEMENT FIELD

Panel: JOSEPH JURAN, Management Consultant, Tuckahoe, New York
WARREN R. PURCELL, Raytheon Manufacturing Company, Newton, Massachusetts
Subject: **"Management Field"**
Moderator: WAYNE M. BIKLEN, American Safety Razor Products Corporation, Staunton, Virginia

6 EXTENDING QUALITY CONTROL BY IN-PLANT TRAINING

Panel: DAVID S. CHAMBERS, University of Tennessee, Knoxville, Tennessee
ALLEN R. CRAWFORD, Standard Oil Company of New Jersey, New York, New York
Subject: **"Extending Quality Control by In-Plant Training"**
Moderator: BONNIE B. SMALL, Western Electric Company, Allentown, Pennsylvania

Convention Program

REGISTRATION FORM

Thirteenth Annual Convention, American Society for Quality Control

PLEASE PRINT
This information will appear on your badge

Name Mrs. Mr. Miss _____

Company _____

Address _____

City and State _____

Mailing address ONLY if _____

different from above _____

PLEASE INDICATE whether you are a Member of A.S.Q.C.

NO ☐ YES ☐

Section _____

If you are making reservations for more than one person, please provide all requested information for each such person on additional sheets using a separate sheet for each person. Your local A.S.Q.C. Section Secretary has additional copies of this brochure, if you need some.

REGISTER IMMEDIATELY: If, after having registered, you are unable to attend, your registration fee will be refunded provided the Registrar is notified by FRIDAY, MAY 22, 1959.

To assist your committee in planning space assignments, please indicate by placing an X in the appropriate boxes below for those sessions which you plan to attend.

	A	B	C	D	E	F	G	PANEL
MONDAY MORNING								
MONDAY AFTERNOON								
TUESDAY MORNING								
TUESDAY AFTERNOON								
WEDNESDAY MORNING								
WEDNESDAY AFTERNOON								

MAKE YOUR SELECTION FROM THE OPTIONS PROVIDED ON THE REVERSE SIDE. PLEASE OBSERVE PRICE DIFFERENTIAL BETWEEN A.S.Q.C. MEMBERS AND NON-MEMBERS.

FOLD HERE

REGISTRATION FEES

COMPLETE

	A.S.Q.C. Members	Non-Members
Complete: Includes 3 Luncheons, Banquet, and Transactions	☐ $30.00	☐ $35.00
Same as above but without Banquet	☐ 25.00	☐ 30.00
All 3 Days, Technical Sessions Only: No Meals, but includes Transactions	☐ 15.00	☐ 20.00

SINGLE DAYS

Technical sessions only (Luncheons and Transactions Extra)	Monday	☐ 5.00	☐ 7.00
	Tuesday	☐ 5.00	☐ 7.00
	Wednesday	☐ 5.00	☐ 7.00

SUPPLEMENTAL

Extra Meals:		
Monday Luncheon	☐ 5.00	☐ 5.00
Tuesday Luncheon	☐ 5.00	☐ 5.00
Wednesday Luncheon	☐ 5.00	☐ 5.00
Annual Banquet, Tuesday	☐ 9.00	☐ 9.00
Extra copies of Transactions, each (Available ONLY to Registrants)	☐ 3.00	☐ 3.00
Social Evening, Monday	☐ 3.00	☐ 3.00
Ladies' Program	☐ 6.00	☐ 6.00

CHECK ATTACHED FOR TOTAL ____ $_____ or $_____

Advance registrations can be processed only when accompanied by payment in full.

Are you sure you have used the proper column?
Have you filled in the reverse side COMPLETELY?

Make checks payable to: A.S.Q.C. CONVENTIONS.

MAIL TO:
WADE R. WEAVER
Republic Steel Corp.
Cleveland 1, Ohio

TEAR OUT

13th Annual Convention and National All-Industry Quality Control & Production Exposition Displays

Booth 120

ELLIOTT SERVICE CO., INC.

A *brand new* exhibit featuring:

HI-VISION QUALITY PROGRAM

Designed to secure and hold employee cooperation in the twin fields of quality improvement and waste reduction. A visual means of moving minds towards plant quality objectives.

MANAGEMENT INFORMATION

A weekly bulletin for Supervisors and Foremen. Designed to provide job help and develop leadership qualities. Includes "human relations" guidance and a practical approach to supervisory planning.

SUGGESTION SYSTEM SERVICE

Complete working material and equipment for operating a successful suggestion plan. Includes colorful, effective publicity for securing quality and quantity suggestions.

Booth 122

THE DOW MECHANICAL CORP.

Featured at the Dow Mechanical Booth will be the internationally known DOW-GAGE and TACOMP STUB with a new adapter with which a standard line of FLUSH PIN gages for tolerances down to 0.0005 or less can be used.

Also on exhibit will be various standard accessories for the basic gages including adapters, diameter attachments, bar gages, and many others.

Booth 209

UNITED STATES AIR FORCE

One of the first sights to greet attendees at the 13th Annual ASQC Convention will be a life-sized missile mounted on the patio in front of the Cleveland Public Auditorium. This example of the first strategic, air-to-surface, operational missile in the Air Force arsenal is the RASCAL.

Inside the Auditorium, in Booth 209, the Air Force will exhibit a scale model of the complete launching complex of the THOR. This missile has been much in the news headlines in recent months.

Booth 210

REPUBLIC STEEL CORP.

Four devices used by Republic Steel to control and evaluate product quality will be on display. Demonstrations and/or working models of the devices will show their contributions to the production of consistent high quality steel.

The following devices will be shown: Pyrometer to measure and record temperature in blast furnaces, open hearths, soaking pits, and heating furnaces; Accu-Ray Measurement and Automatic Strip Thickness Control System utilized by Republic on certain types of processes to improve the thickness uniformity of strip and related products, and provide a continuous readout of results; Sedac Seam Depth Indicator for detecting and determining the extent of seams cracks or flaws on the surface of bars, billets, pipe, etc.; Ultrasonic Reflectoscope for detecting internal defects in bars, billets, blooms, and plate.

Booth 316

UNITED STATES ARMY

Reliable defense of our country depends upon reliable equipment for our Army. Given adequate design, reliability depends largely upon quality control.

One part of the Army's exhibit will be the recently successful moon shot, the probe launched into space by an Army vehicle, the JUPITER missile.

The main theme of the exhibit will be quality control in logistics support of the modern Army and how the developing, procuring, and producing activities for Army equipment operate as a team.

Booth 417

AMERICAN CYSTOSCOPE MAKERS, INC.

A cordial invitation is extended to ASQC members and guests to visit Booth 417. Latest type and design Borescopes will be on display. Representatives will welcome the opportunity of discussing applications you may have for these instruments.

Booth 418

CUSTOM SCIENTIFIC INSTRUMENTS, INC.

CSI will have on display units which are used for calibrating, inspecting, testing and working of metals, plastics and other materials and equipment.

The units are: Dial Indicator Calibrator, Templin Calibrator, Gregg Tension Ring, Microscope Stage or Traveling Microscope, Gear Runout Tester, Traveler Hardness Tester, Pittsburg Thermal Conductivity Probe, Dow Gas Transmission Cell, and a four inch Swing Dividing Head and companion five inch Rotary Table.

M. E. CUNNINGHAM CO.

This display will feature Safety Steel Marking Equipment. These will include: inspection stamps, inspectors hammers, utility marking outfit, type holders, wedge grip letters and figures, hevi-bevl letters and figures, insert stamps for marking machine, Safety OE Engineer Hammers, the versatile GRD-960-2 Marking Fixture, and other types of marking equipment for use in QC.

HOTEL RESERVATIONS

Detach the coupon part of this page and fill in all the required information. Indicate your alternate preference of hotels and accommodations by placing the numerals 1, 2, 3 in the appropriate hotel boxes and a check mark (√) in the box indicating the type of accommodations desired. Mail the completed form to the *Hotel Reservation Bureau, Cleveland Convention and Visitors Bureau, 511 Terminal Tower, Cleveland 13, Ohio.*

Should the requested room in the hotels you selected be reserved prior to the receipt of your reservation, the Housing Committee will assign you comparable accommodations elsewhere. The hotel accepting your reservation will confirm directly to you.

IMPORTANT: Reservations mailed to the Convention Bureau must be received not later than May 11th. While the Convention Bureau will try to handle requests after this date, room commitments made by the hotels will have lapsed, and there can be no guarantee that reservations can be made. If, after making reservations, you find it impossible to attend, please notify the Housing Bureau promptly.

Confirmed reservations will be held by the hotel only until 6:00 p.m. of the arrival date unless later arrival time is specified.

HOTEL RESERVATION FORM

1959 A.S.Q.C. CONVENTION — HOTEL CLEVELAND — MAY 25, 26, 27, 1959

Convention Headquarters — Hotel Cleveland (Check Hotel and Type of Accommodation desired)

	☐ Single	☐ Double	☐ Twin	☐ (2-Rooms) Suites
☐ AUDITORIUM HOTEL	$5.50- 9.50	$7.50-11.50	$11.00-14.00	$28.00
☐ CARTER HOTEL	6.50-10.75	8.50-14.00	10.50-16.00	27.50-37.50
☐ CLEVELAND HOTEL	6.50-11.00	9.50-13.50	12.00-19.00	25.00-50.00
☐ MANGER HOTEL	6.00-10.00	9.00-10.50 Studios	10.00-14.50 14.50-30.00	22.00-27.00 27.00-38.50
☐ STATLER HOTEL	6.50-14.00	12.00-15.00	13.00-22.00	27.00-37.00

ROOM RATES SUBJECT TO CHANGE WITHOUT NOTICE

ARRIVAL DATE..... TIME..... DEPARTURE DATE.....

IMPORTANT: Mail Hotel Reservation Forms to:
HOTEL RESERVATION BUREAU — Cleveland Convention & Visitors Bureau
511 Terminal Tower, Cleveland 13, Ohio

Reservations for: (Please print Name—Address)

(1) .....

.....

.....

Additional Occupants (Name and City)

(2) .....

.....

.....

"Are you inferring that

I don't know the score

on my own operations?"

Charts and curves and bar-graphs have no more relation to reality than tea-leaves . . . *if* they are not drawn from accurate, current facts-in-figures on the operation of machines and processes.

And such facts-in-figures are readily available from Veeder-Root Counters that are easily attachable to your equipment. Inexpensive, too, for what they do . . . counting in terms of turns, strokes, pieces, lengths, volumes, impulses, shadows or any unit you want. Then you'll always *know the score* . . . down to the last decimal point, at any given moment. Let us figure how to do it. Write.

You always "Know the score" when you count on Veeder-Root!

NEW
High Speed, Quick Reset
REVOLUTION COUNTER

This is one of scores of types of counters made by Veeder-Root for manual, mechanical and electrical counting. This counter runs at speeds up to 6,000 rpm . . . resets to zero with one flick of the lever. Also available with predetermining feature.

Everyone can Count on VR®

Veeder-Root Inc.

Hartford 2, Connecticut

Hartford, Conn. • Greenville, S. C. • Altoona, Pa. • Chicago
New York • Los Angeles • San Francisco • Montreal

Offices and Agents in Principal Cities

(Continued from page 22)

mercially available shock and vibration measuring systems has been published by Columbia Research Laboratories. The systems described are fully integrated both in instrumentation and packaging, and are complete systems featuring automatic control, self-calibration and requiring no additional equipment.

♦ ♦ ♦

L-3-3—New type of laboratory ovens and furnaces are illustrated and described in a new four page bulletin issued by Soiltest, Inc. The ovens and furnaces are designed for use in industrial plants for manufacturing processes and development work and in educational, research and quality control laboratories of all types.

♦ ♦ ♦

L-4-7—A new two-page bulletin describing the features, applications, and specifications of the Gilmore Portable Digital Indicator and Force Calibrator, Model 170, is being offered by the manufacturer. The Model 170 serves as a calibration standard for weight, force and thrust measuring systems, or as a high accuracy portable field indicator.

Report of the Nominating Committee

The Nominating Committee has given careful consideration to all persons suggested for the American Society for Quality Control elective positions for the year 1959-60 and recommends the following slate.

For President:
C. E. Fisher
Bell Telephone Laboratories
New York, New York

For Vice Presidents:
L. S. Eichelberger
A. O. Smith Corporation
Milwaukee, Wisconsin

A. V. Feigenbaum
General Electric Company
New York, New York

J. Y. McClure
Convair
Fort Worth, Texas

E. R. Ott
Rutgers University
New Brunswick, New Jersey

For Executive Secretary:
D. S. Chambers
University of Tennessee
Knoxville, Tennessee

For Treasurer:
Allan M. Hull
United Air Lines
San Francisco, California

Each of these persons has been contacted and has agreed to allow his name to be placed in nomination and to serve if elected.

In addition to this slate, a legal petition was received requesting that the name of C. T. Shewell (Humble Oil & Refining Company, Houston, Texas) be placed on the ballot as a candidate for Vice President.

The new Vertical Illuminator and the AO Spencer Cycloptic Stereoscopic Microscope make a unique team that can be the answer to your problem whether it's the inspection of detail in small diameter, deep hole borings, or delicate assembly of miniaturized parts where every move is critical.

This low-cost illuminator readily attaches to the Cycloptic to provide efficient, shadowless illumination deep inside small orifices...and the Cycloptic delivers realistic, erect, true three-dimensional magnification of the illuminated detail.

The remarkable long working distance afforded by Cycloptic (up to 7 inches when Vertical Illuminator is used with 53 and 59 Series) gives you *plus* advantages . . . permits ample room for large size objects or inspection and assembly tools.

Add this unit to your present Cycloptic or ask about low-cost Vertical Illuminator and Cycloptic stereoscopic microscope combinations.

American Optical
COMPANY
INSTRUMENT DIVISION, BUFFALO 15, NEW YORK

Dept. P248

Please send me FULL INFORMATION on the NEW AO SPENCER VERTICAL ILLUMINATOR AND CYCLOPTIC MICROSCOPES.

NAME_____

ADDRESS_____

CITY_____ ZONE____ STATE_____

section briefs

ALBUQUERQUE . . . The Feb. 16 meeting featured Dr. Donald McMillan from the Nuclear Propulsion Division at Los Alamos Laboratory. His subject was "Material problems in the Rover program." Dr. McMillan's discussion revealed the many problems in providing material that will meet the temperature requirements necessary in nuclear propulsion.

ALLENTOWN-BETHLEHEM . . . The Feb. 11 meeting consisted of an interesting tour of the Western Electric Company plant in Allentown. After registration, guests were welcomed by J. A. Decker who briefly discussed QC at Western Electric.

The attending members were then divided into small groups and assigned to guides who conducted the tours. The groups stopped at various locations where narrators explained the operations that were being performed. At the end of the tour refreshments were served in the auditorium. Bob Schin gave an excellent talk on "QC engineering." A discussion period followed after which the guests departed having received a very favorable impression of the Western Electric Company's use of QC, and above all the caliber of its personnel. It was an afternoon well spent.

BALTIMORE . . . The Feb. 20 Ladies' Night dinner meeting was highlighted by the presence of Dr. Colston E. Warne, who spoke on "consumer quality." Dr. Warne is president of Consumers Union, publishers of the nationally known magazine "Consumer Reports." His talk was of special interest to the group of 55 who attended since it dealt with the methods used by Consumers Union in evaluating various products currently on the market.

February 22-28 was Engineers Week and part of its success was due to the fine publicity job done by Gordon A. Baines, chairman of the section's relations with technical societies committee.

Section members Cullen, Glocker, Kulp, MacCrehan, and Taylor and their companies are sponsoring high school students with the object to engender an interest in the engineering profession.

BATTLE CREEK-KALAMAZOO . . . Thirty-six certificates were awarded to members of the section's basic QC course recently completed.

Carl Demrick, Ampex Division of Chrysler Corp., presented a very fine talk at the Mar. 13 meeting. Mr. Demrick discussed "Management's part in QC."

The 2nd annual ladies' night will be held May 8 at the Western Michigan University Cafeteria. The new officers will be installed. Prof. Fred Beeler, Western Michigan, will be host. He will discuss his recent trip to Europe.

BUFFALO . . . An enjoyable evening was had by all when the Buffalo and St. Catherines sections had their joint meeting. Following a delicious roast beef dinner, the group was treated to a fine talk by Dr. A. V. Feigenbaum of the General Electric Co. whose subject was "Total quality control."

The Feb. 23 dinner meeting consisted of a tour of the Harrison Radiator Div., GMC, plus a talk by Howard R. Bolton. Mr. Bolton discussed "Developing the quality attitude."

On Mar. 1 a course in SQC, cosponsored by the section and D'Youville College, was started. The course is being taught by section member Joseph L. Giocle.

A tour of the Western Electric Co., Tonawanda, will be held on Apr. 27. The annual election of officers will also be held.

On May 18 a dinner meeting will be held at the Boots and Saddle Restaurant, Niagara Falls. Personnel of the Bureau of Ordnance, Navy Department, will present a discussion on "Sampling procedures for inspection by variables, MIL-STD-414."

BUZZARDS BAY . . . J. P. Murphy, Inspector of Naval Material, Boston, was guest speaker at the Feb. 12 meeting. His subject was "Government field inspectors' problems in vendor-vendee relationships." He discussed QC requirements in vendors' plants; marginal vendors; modification of contracts; EOM inspection deadlines; and Department of Defense quality assurance concept and policy. He was assisted by George Sakalaris of the Providence inspection office. A lively question period followed his presentation. Section chairman Hans E. Picard of the Aerovox Corp. presided at the business session.

CHARLESTON . . . A large number of our members are from the local chemical industries and they were gratified with the subject of a recent meeting. Dr. Grant Wernimont, Eastman Kodak Co., spoke on "Precision and accuracy in methods of analysis."

CHATTANOOGA . . . The joint one-day conference held in February by the section and the University of Chattanooga was well received by the 104 persons who attended.

The May 12 meeting is "Ladies' Night." Members are urged to make arrangements with their ladies-fair to go out and attend an exceptionally fine meeting.

CHICAGO . . . Satisfactory attendance has been the gratifying result of the basic training course at the Navy Pier which was recently completed.

The outstanding event of the May 13 meeting to be held at the Furniture Mart will be the bestowal of honors on the

Akron-Canton Section Receives Section Charter

The 109th section of ASQC came into being the night of January 22, 1959 when President Fisher presented the Akron-Canton section with their Charter. In addition to presenting the Charter, Mr. Fisher was the feature speaker of the evening and addressed the group on the subject of "ASQC, Its Objectives and Its Programs." Participating in welcoming the section into the Society were Wade Weaver, District 8 Representative Gordon Thompson, District 7 Representative John F. Occasione, District 7 Director Steve Bates, and Cleveland Section vice chairman Jim Osterling.

Although beset with some of the most adverse weather of the year, the kick-off meeting had 104 in attendance. The section presently has a membership of 106 and is anticipating a much larger roster once our membership campaign has been completed. Officers for the new section are: chairman—D. L. Dewing, General Tire & Rubber Co.; vice chairman—R. W. Dorn, Timken Roller Bearing Co.; secretary—C. A. Ritchie, B. F. Goodrich Co.; treasurer—L. A. Bedford, Goodyear Tire & Rubber Co.

Society President C. E. Fisher is shown presenting the section charter to Donald L. Dewing, chairman of the newly formed Akron-Canton section.

winners of the "new ideas contest." The winners will share the limelight.

Further evidence of the activity of the section is the special QC course being conducted by the evening division of Northwestern University.

CINCINNATI . . . At the Feb. 18 meeting D. H. W. Allan, American Iron & Steel Institute, gave a very interesting talk on "Developing industry standards by statistical methods." He cited examples and methods found practical for the iron and steel industry here in our country.

CLEVELAND . . . On Feb. 13 Frank Caplan, Westinghouse Electric Corp., was guest speaker. He gave a talk on "QC in the atomic industry." When Mr. Caplan was through everyone realized how much quality goes into the atomic program.

COLUMBUS . . . The Feb. 18 meeting featured John W. Gower who spoke on "The evolution of the legal aspects of quality." In his talk, Mr. Gower developed the background of a company's responsibility for the quality of its products. These developments were projected and a forecast of future responsibilities was formulated.

Lewis J. Polk, president of the Sheffield Corporation, will be the principle speaker at our annual management dinner meeting to be held May 13 at the Southern Hotel at 6:30 pm. It will provide an excellent opportunity for local plant management groups to hear views on QC procedures as expressed by representatives of management from other companies.

CORNING-ELMIRA . . . The February meeting was cancelled due to bad weather conditions. Disappointment was widespread since Leonard Seder was to have been the featured speaker.

An all-day conference, cosponsored by the section and the Binghamton section, will be held May 2 at Cornell University. Speakers include: M. M. Lightstone, Chrysler Corp.; Richard Banas, Corborundum Co.; J. E. Culbertson, Western Electric Co.; Ralph Kuehn, IBM Corp.; Leonard A. Seder, Consultant; Thomas A. Budne, Consultant; and J. D. Heide, U. S. Rubber Co. Complete information can be obtained from A. P. Stergion, Corning Glass Works, Corning, N. Y.

CUMBERLAND . . . Leon Gilford, U. S. Census Bureau, was the guest speaker at the February dinner meeting held at the Ali Ghan Shrine Country Club. His topic was "Data processing" and was of special interest to the local group.

The last scheduled meeting of the season will be held on May 7. The program will be highlighted by a talk on "Sampling plans on variables" to be given by Mr. Tallon of Convair—Fort Worth.

DALLAS-FORT WORTH . . . Frank H. Squires, Topp Mfg. Co., spoke on Feb. 11. The topic of his talk was "The management of reliability programs." Thirty-one members and 20 guests attended. This was Mr. Squires' last stop on his tour of Texas sections. He pointed out that the management of reliability programs should be in the hands of statistically orientated men. This, generally speaking, would require men with a wide background in QC.

On Feb. 7 the program chairmen of the four Texas sections met at the Ben Milam Hotel in Houston and planned the 1959-60 program for each of the sections. The program chairman of the Dallas-Fort Worth section was selected to contact all of the speakers. The South Texas section was host for the meeting.

DELAWARE . . . For the past several years the section has been taking up the May meeting with a conducted tour of a manufacturing plant in the area. We are fortunate this year to have scheduled a tour of the Scott Paper Co. plant in Chester, Pa. on May 7. The group will be shown the manufacturing process from virgin pulp to various packaged paper products. Following the tour the group will be briefed on the company's QC program. Later, section members will assemble at the Lord De La Warr Hotel in Wilmington for dinner and a brief business meeting.

No regular meeting was held in February as the section was host to the very successful two-day Middle Atlantic Conference which was held in Atlantic City, N. J.

ERIE . . . The February meeting was a joint venture with the Manufacturers' Association of Erie. Eighty-five persons attended the meeting and heard Dorian Shainin, Rath & Strong, Inc., give an excellent presentation on the subject "How managements have drastically reduced operating costs." Preceding Mr. Shainin's talk, W. Yahn (president of the Manufacturers' Association of Erie and chairman of the board of American Sterilizer Co.) made some appropriate remarks.

EVANSVILLE-OWENSBORO . . . Edwin Sheeter, Sonotone Corp., addressed the members at the Feb. 17 meeting. "Narrow limit gaging" was the topic of the talk.

The section will hold its annual ladies' night in Owensboro on May 19.

GEORGIA (Atlanta Group) . . . The Atlanta group met at Georgia Tech on Feb. 16 for a discussion of student problems. Dr. J. J. Moder presented an example of an economic problem concerning how often to take samples. E. G. Field presented a practical problem in metal working concerning time to reset or to grind tools. J. M. Wright presented a problem in applying control charts to demerits in sampling clerical work.

GREATER DETROIT . . . Harvey W. Fritz, Army Rocket & Missile Agency, spoke on "Achievement of reliability in complex systems" at the Feb. 17 meeting. Of particular interest was the "reliability demonstrator" which proved to be very intriguing to the audience. This event was co-sponsored by the greater Detroit sections of IRE and ARS.

From all reports the Blue Water Subsection's "International Night" was certainly a success. Dr. Brant Bonner of the Dow Chemical Co. spoke on "Evolutionary operation." His presentation outlined a technique for operating a manufacturing process to yield information for optimizing the process.

The 2nd annual government-industry meeting will take place on May 2. This year's theme will be "Tools for evaluating QC problems."

GREATER MUSKEGON . . . Our annual "Ladies' Night" in February was attended by 44 persons. The attendance was drastically reduced in number due to heavy snow storms and poor driving conditions. All of the ladies were presented with corsages. Door prizes were won by Merrill Bailey, David Anderson, Bill Hume, and Marvin Ziehms. Herbert Jones, Spanish instructor at Western Michigan University, gave a very interesting and pictorial (colored slides) presentation of "A fishing trip into the mountains of Wyoming."

Chairman Merrill Bailey presented monetary gifts to Glenn Bailey and William Poe, instructors of our very successful QC course.

May 11 is the date of our joint meeting with the personnel, production control, and safety groups of the Muskegon Manufacturers' Association.

HAMILTON . . . Due to an unfortunate change in the weather which brought sleet and ice storms to this district, the attendance from this section at the joint meeting in St. Catharines on Feb. 10 was seriously affected. It was, how-

HE KNOWS
EXACTLY
to less than .0001"
the measurements of close-tolerance holes he is producing:
1 exact size shown readable to fraction of .0001". (a fixed — not passing reading.)
2 front or back taper, exact amount of.
3 ovality, exact amount of diameter variation.
4 bell mouth or barrel shape, exact amount of.
SELF-ALIGNING, SELF-CENTERING
Comtorplug rules out guess work, assures precise gaging independent of operator variations.
For holes 1/8" to 10" diameter
SEND FOR BULLETIN 50
COMTOR COMPANY, 80 FARWELL ST., WALTHAM 54, MASS.
COMTORPLUG

SECTION CALENDAR (APRIL 25—MAY 31)

SECTION	DATE	PLACE	TIME	SUBJECT	SPEAKER
Albany	May 14	———	———	Symposium	———
Allentown-Bethlehem	May 13	Hotel Traylor	8:00 pm	Programming the QC Engineering Job	Wm. Masser, General Electric Co.
Baltimore	May 19	Wilson's Restaurant	7:15	Management Aspects of QC	J. D. Englar, McCormick and Co.
Battle Creek-Kalamazoo	May 8	Western Michigan University	6:30	2nd Annual Ladies' Night	Dr. Fred Beeler, Western Michigan University
Buffalo	Apr. 27	Western Electric Co., Tonawanda	6:30	Plant Tour (Election of Officers)	———
	May 18	Boots & Saddle Restaurant, Niagara Falls	6:30	Sampling Procedures for Inspection by Variables	———
Buzzards Bay	May 14	Continental Screw Co.	8:00	Quality Control	Paul Krensky, Consultant
Chattanooga	May 12	Hotel Patten	6:30	Ladies' Night	———
Chicago	May 13	Furniture Mart	5:00	Winners of the New Ideas Contest	———
Cincinnati	May 20	Engineering Society Bldg.	8:00	Process Controls	George T. McCollough, Jr., Wyandotte Chemical Corp.
Columbus	May 13	Southern Hotel	6:30	Management Looks at QC	Louis J. Polk, Sheffield Corp.
Corning-Elmira	May 2	Cornell University, Ithaca	9:00 am	All-Day Conference	———
	May 12	Hotel Langwell	7:00 pm	Management Night	Marsh B. Gwynn, Eastman Kodak Co.
Cumberland	May 7	———	6:30	Sampling Plans on Variables	D. B. Tallon, Convair-Fort Worth
Delaware	May 7	Scott Paper Co., Chester, Pa.	———	Plant Tour	———
Evansville-Owensboro	May 19	Owensboro	6:30	Ladies' Night	———
Greater Detroit	May 2	Detroit Tank Arsenal	———	2nd Annual Government-Industry Meeting	———
Greater Muskegon	May 11	Bill Stern's Steak House	6:30	———	———
Hamilton	May 7	McMaster University	8:00	Tour	———
Hamilton-Middletown	May 13	Anthony Wayne Hotel	6:30	QC in the Production of Aluminum Foil	O. H. Bishop, Reynolds Metal Co.
Harrisburg	May 6	Harvey's Smorgasbord, York	6:45	Application and Use of the New MIL-STD-414	Elmer Collins, Department of the Navy
Hartford	May 19	Nutmegger House	6:30	100 Percent Inspection—Its Strength, Weaknesses and What to do About It	Dorian Shainin, Rath & Strong, Inc.
Huntsville	May 21	Decatur	———	SQC Training at the Ordnance Management Engineering Training Agency	John F. McAreavy, Rock Island Arsenal
Kankakee-Joliet	May 4	Maple Manor, Kankakee	6:30	Developing Quality Attitude & Pride of Workmanship	Dr. Harry Sagen, Abbot Laboratories
Kansas City, Mo.	May 23	117th & Holmes	3:00	Spring Family Picnic	W. G. Atwater (Host)
Los Angeles	May 13	Rodger Young Auditorium	8:00	QC Vendor-Vendee Relationships	Halmond L. Parks, Aerojet-General Corp. and J. B. Buehler, North American Aviation
Louisville	May 1	Bellarmine College	6:30	———	Dr. Arkin, Philip Morris, Inc.
Mid-Hudson	May 12	Kingston	7:00	Panel Discussion	Paul Heltz, IBM Corp. (Moderator)
Milwaukee	May 4	Pabst Brewing Co.	8:00	Annual Business Meeting and Plant Tour	———
Montreal	May 13	C.I.L. Bldg.	8:15	QC Through Acceptance Sampling	R. Vance Ward, Canadian Industries, Ltd.
Muncie	May 21	Student Center	7:30	Linear Correlation	Leo J. Nartker, Delco Products Div., GMC
Pensacola-Mobile	May 29	Harborview Restaurant, Pensacola	7:00	Fabric First, Fashion First?	Miss Florence Kyler, Chemstrand Corp.
Pittsburgh	Apr. 28	YWCA, Wood Street	6:30	Wives' Night—What Your Husband Does in QC	Miss Besse B. Day, U. S. Navy Bureau of Ships
	May 19	Jones & Laughlin Steel Corp.	8:00	Plant Tour	———
Pittsfield	May 13	Stanley Club	6:45	Inspection & Gaging	K. A. Heinhold, Federal Products Corp.
Portland	May 5	Precision Castparts Co.	7:30	Plant Tour—QC in Small Job Shops	R. Lyons and R. Day, Precision Castparts Co.
Rhode Island	May 21	Engineering Society Bldg.	8:00	Quality Reports to Management	James R. Gilman, Bay State Abrasive Products
Rochester	May 23	Happy Acres Country Club	———	Family Outing—Food & Beverage Industries Sub-Group	———
St. Charles	May 19	Club Arcada	4:30	Quality Incentives	Prof. H. R. Swenson, Illinois Institute of Technology
			6:30	Practical Aspects of Sampling	Keith E. Ross, Essex Wire Corp.
St. Louis	May 20	Golden Fried Chicken Loaf Restaurant	6:30	Sampling as a Basis for Decisions	Prof. H. Allen Wallis, University of Chicago
Salt Lake City	May 14	Kennecott Copper Co.	———	Plant Tour	———
San Antonio	May 12	Hilton Hotel	8:00	The Bay State Quality Assurance Plan	James R. Gilman, Bay State Abrasive Products
South Bend-Mishawaka	May 21	Bendix Legion Post	7:30	Administrative Applications	Marvin Claeys, United Air Lines
Syracuse	Apr. 28	Turn Hall	6:30	Regression Analysis	Prof. Mason E. Wescott, Rutgers University
	May 19	Turn Hall	6:30	QC of Castings	Richard C. Hood, Carrier Corp.
Toronto	May 6	University of Toronto	8:00	Process Control in a Small Industry	Paul Goddard, Scripto of Canada, Ltd.
	May 20	———	———	Ladies' Night	———
Tulsa	May 18	Borden's Cafeteria, Sheridan Village	6:15	Statistics in QC	Charles Bicking, The Carborundum Co.
Utica	May 21	Hotel Hamilton	6:00	Installation of Officers	———
Youngstown	May 7	Vienna Air Base	6:30	Tour—Smorgasbord	———

ever, an excellent meeting with Dr. A. V. Feigenbaum delivering his usual fine paper.

We are all looking forward to the tour of the reactor and engineering facilities of McMaster University on May 7. This being the final meeting of the year, a full attendance of members is anticipated.

HAMILTON-MIDDLETOWN . . . The Bendix-Hamilton Division plant was a recent meeting place. A tour was taken by the group to observe the testing and manufacturing facilities. Unique processes in manufacturing of fuel injection and guidance systems for planes and rockets were seen. It was interesting to find out that it takes a long time to test a fuel injection system under all different simulated conditions. Refreshments were served. Course certificates were handed out to members who had attended QC courses.

On May 13 O. H. Bishop will describe the Reynolds Metal Company's experience in the application of fundamentals of statistical methods to continuous products (such as the rolling of foil) and their actions in control of one characteristic for one product throughout production to consumer market.

HARRISBURG . . . May 6 is the date of the meeting at Harvey's Smorgasbord in York. Elmer Collins, Office of the Inspector of Ordnance, Department of the Navy, will be our guest speaker. Mr. Collins will discuss "The application and use of the new MIL-STD-414, sampling inspection by variables." He will discuss advantages in lot acceptance inspection and how it can apply to many of the problems we encounter.

HARTFORD . . . Eugene Ellis of Pratt and Whitney Aircraft spoke at a special technical session held Feb. 2. His talk dealt with his own development of a mechanical lot plot template which was used to overcome a gauging bottle neck. A sample unit was available for demonstration to the audience following the talk.

HUNTSVILLE . . . The February meeting was held at Steadman's Restaurant. Thirty-eight people were present for dinner and heard a very fine presentation of "Life testing" by Dr. A. C. Cohen, Jr., University of Georgia.

Other recent meetings included a tour of the Decatur plant of Wolverine Tube—Division of Calumet & Hecla and Dr. Paul S. Olmstead's talk on "Statistical QC in engineering research and development."

KANKAKEE-JOLIET . . . The what and how of corrective action in QC was discussed at a recent meeting. The speaker was Edward Clark, supervisor of QC engineering at the GMC hydramatic transmission plant in Detroit.

Mr. Clark said that part of the QC job to push corrective action, even when management does not act, by use of knowledge of human nature, persuasive force, and ability to get mad when necessary. Approximately 40 members attended the meeting.

KANSAS CITY, MO. . . . At the Feb. 19 meeting William Collins of the Johns-Manville Corp. gave a very interesting talk on the "Human aspects of QC." At the same meeting, a welding workshop clinic was conducted by Joseph M. Payne, staff engineer, Butler Mfg. Co.

LOS ANGELES . . . On Feb. 11 John W. Young, North American Aviation, Inc., outlined "QC's role in the weapons system concept." During the same meeting Lt. Col. Frank Krause showed slides and movies of Vandenberg AFB.

On Wednesday, May 13, Halmond L. Parks of Aerojet-General Corp. and James B. Buehler of North American Aviation will discuss "QC vendor-vendee relations."

LOUISVILLE . . . The Feb. 9 meeting took place at the University of Louisville Speech School with 28 members present. The speaker of the evening was William E. Barker, Jet Engine Department, General Electric Co. He gave an informative technical discussion on "Are you sure?" which dealt with gage repeatability. Mr. Barker went into detail concerning the variability—or lack of repeatability—in gage measurement and a special "$\overline{R}$ method" of determining gage repeatability.

The Louisville Scientific Council Banquet will be held on May 14 and this year our section will be host. Plans are near completion for this event but full support is still requested of all section members.

MEMPHIS . . . Wayne Bradley, U. S. Army Engineer District, spoke to the section on Feb. 5. Mr. Bradley's topic was "Latest Department of Defense concepts on procedures and inspection." The presentation of this topic was unique. Mr. Bradley enacted the procedure for the awarding of a government contract.

MID-HUDSON . . . Purchasing agents from 14 local industries were among the 87 guests and members present at the Feb. 3 workshop seminar staged by Richard A. Hulnick, IBM Corp., at the Poughkeepsie Inn. "Should purchasing or QC decide when and when not to continue doing business with a supplier" was the subject for discussion. After the various groups completed their discussions, individual group leaders made their conclusions. Mr. Hulnick summarized the results from exchange of experiences in discussion groups. The meeting was hailed as a great success.

The May 12 meeting will be held in Kingston. Paul Heitz of IBM Corp. will act as moderator for the planned panel discussion.

MILWAUKEE . . . Forty people heard Phil Kinsler, research statistician with the Oscar-Mayer Co. of Madison, speak on statistical applications to industrial engineering problems at a recent meeting. This marked the second month in a row that the featured speaker was supplied by the Oscar Mayer Co. Prior to the regular meeting, a father-son combination of Les and George Eichelberger presented simultaneous training sessions to approximately 20 people with Les pursuing our course on "Introductory probability and statistical inference" and George expounding on "Analysis of variance." In between the training sessions and regular meeting a buffet supper and refreshments (beer, naturally) were enjoyed by the group.

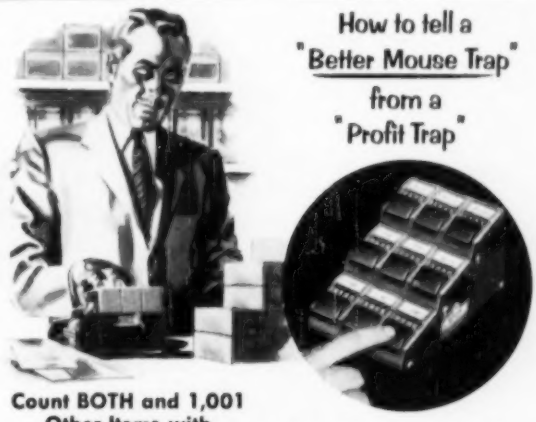
MONTREAL . . . On Feb. 11 a special management night was held. The meeting was preceded by a dinner. Management from Montreal area industries were guests of the section and heard a panel of three teams from management tell what QC had done for their particular industries. The panel was moderated by C. E. Fisher, Society President.

Section members were guests of Canadair, Ltd. of St. Laurent on Feb. 25 for a plant tour. The tour included the aircraft and QC sections.

A "local member night" is planned for May 13. The speaker for this meeting will be the immediate past chairman R. Vance Ward who will discuss "QC through acceptance sampling."

MUNCIE . . . February 19 marked the appearance of our own D. G. Browne. He discussed some of the quality aspects of the Broderick Co. of which he is a vice president. From his vantage point as Society Director he then led an open discussion of some of the problems faced by the Society. A very rewarding meeting!

Our May 21 meeting will feature Leo J. Nartker, Delco Products Div., GMC. His subject will be "Linear Correlation." This will be a joint meeting with the Richmond



How to tell a "Better Mouse Trap" from a "Profit Trap"

Count BOTH and 1,001 Other Items with

VARY-TALLY

Multiple-Unit Reset Counter

Compactly set up on stands in tiers, the Vary-Tally can be supplied in any of 66 combinations, up to 6 banks high and 12 units wide with a minimum of 2 units wide. Also single units.

To know WHICH products, styles, sizes or flavors are "hot" and WHICH are dragging their feet — COUNT! Whether you are a manufacturer or merchant, distributor or dealer — Vary-Tallies can tell you quickly How Many of What, Where and When — Now as against Last Year, Last Month or Yesterday. Traffic engineers, estimators, laboratories, warehouses, offices, restaurants, mail and phone order departments, payroll people and many others find keeping score is no chore with a Vary-Tally. What do *you* want to count? Write for news sheet and prices.

VEEDER-ROOT INC.
Hartford 2, Conn.

Chicago 6, Ill. • New York 19, N. Y.
Greenville, S. C. • Montreal 2, Canada

Offices and Agents in Principal Cities
"THE NAME THAT COUNTS"

section. Dinner will be served in the Pine Shelf Room of the Student Center on the Ball State Campus at 6:30 pm. The address is scheduled for 7:30.

NEW HAMPSHIRE . . . In conjunction with the University of New Hampshire Extension Division, a "Total QC" conference was held on Feb. 20-21 at Durham. Keynoting the conference was Winthrop W. Spencer. He was ably assisted by seminar leaders Ted Schultz and Tom Howley. Registrations included members of management and operating people from 16 different companies from three states. University Prof. Donovan and section chairman Charles Tallman welcomed the group. Ed Shankin of the University gave the summary address and announced that a new basic course, "Industrial QC," will be offered by the same co-sponsors of the conference. The course is to be run in Durham, Nashua, and Keene with Chester Gadzinski, Ted Brownrigg, and Graham Morse, respectively, as instructors.

PENSACOLA-MOBILE . . . The February meeting was held at the Brookley AFB Officers Club. F. W. Vaugh of the Air Research and Development Command was guest speaker. His subject was "QC of the Bomarc missile." A nominating committee was appointed to select a slate of nominees for the annual election. Forty-four members and guests attended the meeting.

The May 29 meeting will be a departure from the norm and is designated as "Ladies' Night." This meeting will be held at the Harborview Restaurant, Pensacola. Miss Florence Kyler, fashion coordinator of the Chemstrand Corp. will be the guest speaker. Her subject will be "Fabric first-fashion first?" There will be a ladies' fashion show immediately following the meeting.

PITTSBURGH . . . The Feb. 24 meeting was quite successful with a most interesting talk on "QC in metal can manufacturing" by John DeCanio of Continental Can Co. Mr. DeCanio discussed the various statistical techniques used in the control of 20 types of tin plate as well as all types of printing inks and over 60 grades of inside enamel. The metal can industry now produces at the rate of 850 cans per minute and requires a great deal of control and machine capability studies in order to produce a quality product which will have good eye appeal as well as not leak.

The section is planning a special "Wives' Night" for Apr. 28. Miss Besse B. Day of the U. S. Bureau of Ships will speak on "What your husband does in QC."

The last meeting of the year will be a plant tour of the Jones & Laughlin Steel Corp., Pittsburgh Works, to be held on May 19.

PITTSFIELD . . . Wallace Stone of IBM Corp. was guest speaker at the Feb. 11 meeting. His topic "QC problems in automated assembly" was accompanied by colored slides depicting some of the processes and problems. The discussion covered quality problems arising in the changeover to automation of an electronic assembly operation.

A ten-week course in basic industrial QC started on Feb. 16. Robert Traver of the General Electric Co. is the instructor of the section sponsored course which has over thirty participants.

On Wednesday evening, May 13, K. A. Heinhold, branch manager of the Federal Products Corp., will discuss the inspection and gaging aspects of QC.

PORTLAND . . . H. Blood of Omark Industries presented a very good lecture at the Benson High School meeting. He presented some very good reasons as to why some elaborate QC plans fell through while some make-shift, spur-of-the-moment plans gave very good results.

Richard Lyons and Richard Day of Precision Castparts Co. will be well prepared for the section's May 5 plant tour and lecture on "QC in small job shops."

RHODE ISLAND . . . At the Feb. 19 meeting Chester A. Gadzinski, Raytheon Mfg. Co., gave a fine talk on "Vendor rating programs." A lively discussion period followed his talk. After the meeting members and guests met with the speaker to discuss mutual problems.

ROCHESTER . . . On Feb. 3 the technical sub-group had Robert Morris as guest speaker. Mr. Morris gave a very interesting talk on digital computer applications.

The food and beverage sub-group held a round table discussion Feb. 9 on "How QC factors affect marketing in the food industry."

February 17 brought Dr. Ellis R. Ott of Rutgers University to the section as guest speaker. Dr. Ott discussed, from personal experience, the obstacles and problems confronting the organization of a QC program in India. Dr. Ott's talk, titled "U. N. Project—SQC in India," was accompanied by a number of color photographs.

ST. CHARLES . . . The section is sponsoring two courses in QC this spring. A basic course in SQC is being taught by Ralph Von Osinski of Chicago Rawhide Mfg. Co. "Professional QC engineering and management" is being conducted by W. R. Fischer and G. S. Evensen of the General Electric Co.

On May 19 Prof. H. R. Swenson will discuss "Quality incentives" at the 4:30 pm session to be held at the Club Arcada. At 6:30, Keith E. Ross of the Essex Wire Corp. will present "Practical aspects of sampling."

ST. LOUIS . . . The section held its annual party on Feb. 21 at the Golden Fried Chicken Loaf Restaurant. Dancing was the order of the evening and a good time was had by all.

SALT LAKE CITY . . . Prof. Ivor Bradley, University of Utah, conducted the education portion of a recent meeting by treating the subject "The basis of statistical theory as explained in stochastic relations." In addition to defining and illustrating stochastic relations, he pleaded for sound judgment and careful analysis to avoid the pitfalls of irrational conclusions.

R. E. Williams, Thiokol Chemical Corp., treated most of the audience to a new subject—"Production and testing of solid fuel propellants." Tracing the rapid development of solid fuel propellants, Mr. Williams illustrated the tremendous strides being made with a sound film. He further emphasized the large and high caliber QC organization required to cope with the problems inherent in such a development.

SAN ANTONIO . . . Frank H. Squires, Topp Industries, Inc., was guest speaker at the Feb. 10 meeting. He presented "Management of reliability programs" which was timely and interesting. It was centered around the arguments concerning who should direct reliability programs—QC executives or engineering executives.

The program chairmen of the Texas sections met in Houston on Feb. 7 and formulated plans to obtain circuit speakers for 1959-60. Eight prominent, nationally known speakers were selected to participate in this tour. (In view of the success of this new idea of obtaining speakers, we of the Texas sections would be most happy to provide any interested sections with information concerning its operation.)

SAN DIEGO . . . In this missile age, "reliability" is a term that has taken on a new meaning. At our February meeting Dr. Leslie W. Ball, reliability consultant, provided the section with an extremely enlightening review of the Defense Department's requirements concerning this elusive goal.

In May, J. Klimberg of Convair-Astronautics will present his company's program for production evaluation tests. This exemplifies the continuous efforts of our program chairman to present in a practical and readily understandable form the everchanging problems that confront industry and the latest means for solving them.

SOUTH BEND-MISHAWAKA . . . The address of F. C. McLaughlin of General Electric Co. on "Measurements and quality costs" was well received.

The May 21 meeting will be a dinner meeting. Marvin Claeys of United Airlines will speak on "Administrative applications."

SOUTHERN CONNECTICUT . . . The ladies' night dinner meeting was such a success that a repeat next year is assured. The arrangements committee did itself proud by making reservations with Cobbs Mill Inn, one of the finest restaurants in this area. During dinner and the social hour prior to dinner the ladies had an opportunity to meet their husband's friends and their wives and to compare notes on the problems of being stuck with a quality controller.

The speaker of the evening was Joseph Moore, Moore and Co. Advertising, Inc., one of the largest agencies in the New England area. He gave a very interesting non-technical

Cornell University Engineering Seminars

A series of seminar discussions will be held on the campus of Cornell University, Ithaca, N. Y. on June 16-19. The discussion leaders and speakers will be comprised of specialists from both industry and the staff of Cornell University.

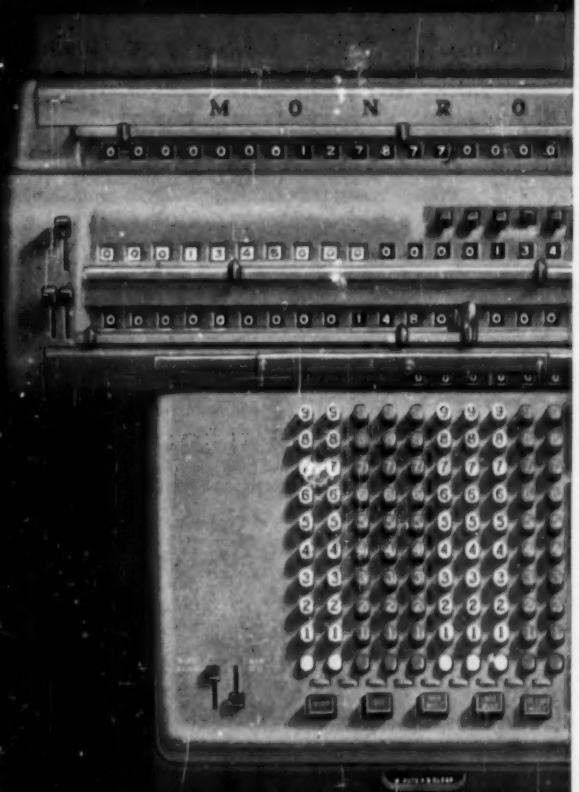
The seminars will cover: industrial management, manufacturing engineering, engineering administration, small plant management, methods and work measurement, computers in production planning, applied industrial and engineering statistics, and statistical aspects of component reliability.

For additional information contact: Andrew Schultz, Jr., Department of Industrial and Engineering Administration, Upson Hall, Cornell University, Ithaca, N. Y.

For the sophisticate in figures...

a Monroe that will do everything other Calculators do,

plus:



1. **Automatic Decimals:** you set all numbers . . . add, multiply, subtract or divide automatically around a single decimal point.

2. **Multi-factor Multiplication:** return the transfer slide and the last product becomes the next multiplier.

3. **"Memory Dials" Accumulation:** products are accumulated automatically in the "Memory Dials" while the results of individual problems appear in another dial. Quotients can be accumulated in one dial while individual quotients appear in another.

4. **Selective Division:** you can divide directly into the "Memory Dials" for super-fast averages or the determination of Standard Deviation.

5. **Automatic Carriage Positioning:** following a multiplication, the carriage automatically positions itself, decimally correct for addition or subtraction.

These features make the 88N the world's most advanced calculator.

For more information on Monroe and statistics, call your Man from Monroe today.

See the MAN from MONROE

for CALCULATING
ADDING · ACCOUNTING
DATA PROCESSING MACHINES

A DIVISION OF LITTON INDUSTRIES

Monroe Calculating Machine Company, Inc., Sales and Service in principal cities everywhere. General offices, Orange, N. J.

Stock List
ASQC PUBLICATIONS

Publication	Price
INDUSTRIAL QUALITY CONTROL	
Vol. XII, XIII, XIV (July 1955—June 1958)	10.00 per vol.
Individual Back Copies	1.00
(1) Subject Index to Vols. I-X	.50
ASQC STANDARDS SERIES	
(6) A1-1951 "Definitions and Symbols for Control Charts"	.50
(7) A2-1957 "Definitions and Symbols for Acceptance Sampling by Attributes"	.50
(8) B1, B2-1958 "Guide for Quality Control and Control Chart Method of Analyzing Data" (ASA Standard Z1.1, 1.2-1958)	2.25
(9) B3-1958 "Control Chart Method of Controlling Quality During Production" (ASA Standard Z1.3-1958)	2.50
GENERAL PUBLICATIONS SERIES	
(11) General Publication No. 2, "Manual for Authors of Technical Papers for Publication in Industrial Quality Control"	
(12) General Publication No. 3, "Span Plan Method of Process Capability Analysis"	2.50
(13) General Publication No. 4, "The Power to Detect a Single Slippage and the Probability of a Type I Error for the Upper Three-Sigma Limit Control Chart for Fraction Defective, No Standard Given"	2.50
CONVENTION TRANSACTIONS	
(21) Fourth Annual Convention "Convention Papers (10 papers) Unbound	30 ea., complete 2.50
(22) Eleventh Annual Convention "Quality Control Convention Transactions, 1957"	3.50
CONFERENCE PROCEEDINGS	
(36) Aircraft Technical Committee, 1953 "Proceedings Aircraft Quality Control Conference" (12 papers) Bound Volume	1.50
(41) "Textile Quality Control Conference Papers," Vol. 3, 1956 27 papers (bound volume)	5.00
(42) Textile Quality Control Conference Papers Vol. 4, 1957 20 papers (bound volume)	5.00
(43) "Textile Quality Control Conference Papers," Vol. 5, 1958 13 papers (bound volume)	5.00
(45) Proceedings of the All-Day Conference on Quality Control, September 7, 1957 14 papers (bound volume)	2.00
(46) Middle Atlantic, 1958 "Middle Atlantic Conference Transactions, 1958"	2.50
(47) 13th Midwest Conference Transactions, 1958 13 papers (bound volume)	3.00
MISCELLANEOUS	
(76) ASTM Manual on Quality Control of Materials	2.50
(79) NSMPA Manual on Statistical Quality Control Volume I, "What and Why"	1.25
(80) NSMPA Manual on Quality Control Sampling Volume II, "Highway Markers to Better Quality"	1.25
(81) NSMPA Manual on Sampling Inspection Volume III, "Do It Yourself Sampling Inspection Installation"	1.25
NSMPA Manuals, Vols. I-III when purchased at same time	***3.50***
(83) Charles R. Hicks, "Fundamentals of Analysis of Variance," Reprint from IQC Vol. XIII, Nos. 2, 3, 4, August, September, October, 1956	.50
(84) Case Histories on Statistical Methods for Quality Control, by Metals Technical Committee (bound volume)	1.00
(85) Morris James Slonim, "Sampling in a Nutshell"	1.00
(86) Warren R. Purcell, "Who Controls Quality—and How?" Reprint from IQC Vol. XV, No. 4, October, 1958	.10
(87) Ralph Allan Bradley, "Determination of Optimum Operating Conditions by Experimental Methods —Part I," Reprint from IQC Vol. XV, No. 1, July, 1958	.15
(88) J. Stuart Hunter, "Determination of Optimum Operating Conditions by Experimental Methods —Part II," Reprint from IQC Vol XV, No. 6, 7, 8, December, 1958, January, February, 1959	.75

AMERICAN SOCIETY FOR QUALITY CONTROL
6197 PLANKINTON BLDG.
161 W. WISCONSIN AVE.
MILWAUKEE 3, WIS.

Date .....

Please send me the copies of ASQC Publications which I have checked below in quantity as indicated. Enclosed is a check or money order for $..... (Remittance must accompany orders less than $3.00. Postage is added to orders not accompanied by a remittance.)

Back Volumes IQC (specify) ..... **Back Copies IQC** .....

(1)	(11)	(36)	(46)	(83) .....
(6)	(12)	(41)	(47)	(84) .....
(7)	(13)	(42)	(76)	(85) .....
(8)	(21)	(43)	(79)	(86) .....
(9)	(22)	(45)	(80)	(87) .....
			(81)	(88) .....

Name .....
(please print or type)

Company .....

Address .....

City ..... **State** .....

Make remittance payable to the American Society for Quality Control, Inc. 4-59

Special bulk order discount on any numbered items: 10% for 10 or more copies; 25% for 50 or more copies.
New service for individual ASQC members only—20% discount on all numbered publications in any quantity.

talk on "How advertising affects quality" spiced with many entertaining Madison Avenue anecdotes.

After the meeting, the executive committee and their wives along with Mr. and Mrs. Moore and other members continued the social hour.

All in all, ladies' night presented a wonderful time for the ladies and a very pleasant meeting for the men.

SYRACUSE . . . The second semester of the QC courses sponsored by the section got under way in February.

As a part of the educational promotion program, the section financially sponsored the attendance of a student at the symposium aranged by the Technical Societies Council of Greater Syracuse held during National Engineers' Week on Feb. 28.

On May 5 the section will join with AIIE and ASME in financially sponsoring a presentation by Dorian Shainin of Rath & Strong, Inc. His topic will be "Practical engineering techniques for improving product reliability." The meeting will be held at Drumlins beginning with cocktails and dinner at 6 pm.

TOLEDO . . . The February meeting consisted of a tour through Libby Glass Division, Owens-Illinois Glass Co. A total of 53 members attended to observe the manufacture of tumblers and fancy glass ware.

TORONTO . . . Irwin Taylor, The Martin Co., favored members and guests at the Feb. 11 meeting with a most interesting discourse on "Frequency distribution analysis." His excellent aproach to this subject was extremely well received and the evening concluded with a lively discussion.

The dinner meeting held on Feb. 25 was highlighted by C. F. Thompson, Budd Corp. His talk, based on non-destructive testing, dealt most effectively with the use of gamma radiography in present day industry.

TULSA . . . The section has been asked to participate in a presentation on reliability and QC before the Douglas Aircraft Company's management club.

The section, along with some 16 other technical societies, will participate in the operation of a special registration booth at the International Petroleum Exposition to be held in Tulsa May 14-23. The booth will register all of the technical and engineering personnel attending the show. All members of ASQC are invited to attend the exposition and register at the booth.

Don Matthews has accepted the task of lecturing and arranging our second course in SQC.

UTICA . . . On Feb. 26 the section joined with other professional societies at the Mohawk Valley Engineers Banquet. This was in observance of National Engineers Week.

The group of 150 was addressed by Brother Amandus Leo, Dean of the Engineering School, Manhattan College. Brother Leo spoke on how Manhattan College is preparing the young engineer for the practical problems he will encounter after graduation. Manhattan College believes in giving the engineering student a solid background in the basic theory underlying the engineering profession. An active question and answer session followed his talk.

YOUNGSTOWN . . . Dr. Fred C. Leone, Case Institute of Technology, addressed the Feb. 5 meeting. His subject was "Significance tests and the dollar sign." Through illustrative examples he illuminated the shadowy area between tests showing significant differences in a technical sense and those showing significant differences in a monetary sense. He urged mutual understanding between people who must base their decisions on technical data and others who must use the dollar sign. Dr. Leone pointed out that the usual approach is to determine by what odds a new method is better than the old one. An interesting discussion period followed his talk.

SIGNIFICANT DIFFERENCES

. . . Allentown-Bethlehem—Section chairman Dave Hilder acted as a moderator at the 1959 Middle Atlantic Conference held at Atlantic City, N. J.

. . . Baltimore—Dr. Colston E. Warne of Consumers Union and Program Chairman Frank Cullen were interviewed at the Feb. 20 dinner meeting by William Rock, program director of local radio station WBAL. These interviews, tape recorded, were incorporated in his afternoon "Open Line Program."

. . . Buffalo—Jack Hendricks, formerly with American Machine & Foundry Co., has been named chief inspector of the Thiokol Chemical Co., Rocket Division, Elkton, Md.

. . . Chicago—Congratulations, Bob—Robert J. Majeski has been promoted from supervisor of the QC department to manager of the QC section at Victor Adding Machine Co.

Back in Chicago—Martin Joseph is now with Kellogg Switchboard & Supply Co. in the electronics division.

. . . Cincinnati—Louis R. Zimov has been appointed vice president—manufacturing for the Crosley Division of AVCO.

. . . Cleveland—Stan Freeman has become a statistician for Westinghouse Electric Corp. of Mansfield.

Dorsey Dean has left Akron to become senior quality assurance engineer for The Martin Co., Cocoa Division, Cocoa, Fla.

Nigel Tantrum of Forget-Me-Not, Ltd., London, England, has just completed six weeks with American Greetings Corp. to learn more about American QC techniques in the greeting card field.

. . . Dallas-Fort Worth—It appears that Dr. A. W. Wortham, section junior past chairman, will be District 14 Director as six of the seven sections have nominated him for that position.

. . . Evansville-Owensboro—The 14th Midwest QC Conference (consisting of 21 technical sessions, a management panel, and basic and advanced SQC training courses) will be held Sept. 14-16 at the French Lick-Sheraton Hotel, French Lick, Ind.

. . . Hamilton-Middletown—Howard Lundeen, formerly process control supervisor with The Pillsbury Co., is now QC manager for Raymond Bag Co., a subsidiary of Albemarle Corp. He will begin duties by starting a QC program in their Middletown plant.

. . . Harrisburg—The section welcomes Prof. Irwin S. Hoffer, formerly of the statistics Department of Temple University.

. . . Hartford—Frank Hauman is to be chairman of the education and seminars committee for the 13th New England Conference to be held in Providence, R. I. in November.

Edward E. Kirkham, chief development engineer of the Pratt and Whitney Co., will speak at the production engineering conference of ASME to be held May 13 in Detroit. His topic will be "Economics of numerical control."

. . . Indianapolis—Theodore W. Meserve has been appointed director of quality control for Chrysler Corporation's Electrical Equipment Division.

. . . Kansas City (Mo.)—Congratulations to Robert F. Cell, former staff engineer, Engineering Division of the Kansas City Division of Bendix Aviation Corp., who was recently promoted to the position of manager of the QC engineering department at the same company.

. . . Metropolitan—John W. Tukey, professor of mathematics at Princeton University and a member of the mathematical

MORE ABSOLUTE CONTROL
Optical Flats
For quicker and more accurate reading to millionths.
Monchromatic Lamps
For brighter helium field for more defined bands.
Portable Bench Center
Accommodates special measuring and indicating devices directly on bed area.
Chamfer Micrometer and Indicator Gages
For fast, accurate, direct chamfer and diameter reading.
LOOK TO ACME SCIENTIFIC CO.
1450 W. Randolph Street, Chicago, Illinois

ASQC Workshop Seminar

Management of Quality Control

Cleveland Hotel May 21-23, 1959

Industry is giving Quality Control a great deal of emphasis because of its potential for improving product quality while increasing productivity and reducing related costs. This increased scope of quality control has multiplied the responsibilities of the Quality Manager. To help him fulfill his new role, the American Society for Quality Control will conduct a workshop-seminar on Management of Quality Control for three days prior to the 13th Annual Convention in Cleveland.

What is the purpose of the workshop-seminar? **To explore in depth, tested methods of increasing the effectiveness of the quality control program in an industrial plant.**

For whom is the program planned? **For present and prospective Quality Managers. It is expected that the applicant will have reasonable familiarity with such standard texts as Grant, Feigenbaum, and Juran. To benefit properly from the seminar, the applicant should have a minimum of several years experience with major responsibility for quality.**

Who will direct and conduct the program? **The Director will be Paul C. Clifford, Professor at Montclair State Teachers College. Speakers and Discussion Leaders will include managers of outstanding quality control programs.**

Registrants will be sent study materials and case studies prior to the conference. *Registration is limited to 75 persons and is complete only on receipt of the registration fee of $100* which includes the cost of three lunches.

All hotel reservations must be made with *Hotel Reservation Bureau, Cleveland Convention and Visitors Bureau, 511 Terminal Tower, Cleveland 13, Ohio.* Indicate if you also plan to attend the 13th Annual ASQC Convention (May 25-27) so your room reservation will be protected. IMPORTANT: You must indicate date and time of arrival and date of departure.

From 8:30 am on May 21 until 5:00 pm on May 23, registrants will have a full schedule, including evenings. The title WORKSHOP has been chosen deliberately.

ASQC Workshop - Seminar
American Society for Quality Control
161 West Wisconsin Avenue
Milwaukee 3, Wisconsin

Please make reservations for the ASQC Workshop-Seminar on Management of Quality Control for the following man who satisfies the registration requirements as indicated in the announcement.

Enclosed is our check for $..... to cover ..... registrants. (Fee—$100 per registrant.)

Name .....

Title .....

Company .....

Address .....

City ..... Zone No. ..... State .....

NOTE: Additional registrations may be made by attaching a list to the above coupon. Please include necessary information for each registrant.

research department of Bell Telephone Laboratories, has been appointed assistant director of research in communications principles at the Laboratories.

. . . Milwaukee—Jim Barrabee, section chairman, has joined Dale Cue (until recently our industrial clinic chairman) at the Hoover Ball and Bearing Co., Ann Arbor, Mich. Dale, who was with the A. O. Smith Corp., is now QC manager at Hoover and Jim will become assistant QC manager. Jim was previously general inspection foreman at International Harvester's Foundry Works in Milwaukee.

. . . Muncie—March saw the departure of senior members F. E. Jolliffe and C. D. Cecil of Warner Gear Division for Borg-Warner's transmission plant in England where they will be temporarily associated with the quality program.

. . . Pittsburgh—James P. Hood has left the Westinghouse Electric Corporation-Bettes Plant to take a position outside of the Pittsburgh area.

John Hromi, section president, was moderator at the "special techniques" discussion of the 1959 Middle Atlantic Conference held in Atlantic City, Feb. 6-7.

. . . Pittsfield—Bob Lee, Peter J. Schweitzer Division of Kimberly-Clark Corp., has accepted a position on the development staff of the Rochester Paper Co., Rochester, Minn.

. . . St. Louis—Daniel Mohoney has transferred to the Toledo office of Owens-Illinois Glass Company. Dan's new address is Hillcrest Hotel, Toledo, Ohio.

. . . Salt Lake City—Eldon Jensen, section past vice chairman, recently completed a three-week course at the Air Force Institute of Technology at Dayton, Ohio. He is also proving to be a top-notch basketball coach. His team, teenagers of the Latter-Day Saints Church (Mormon), have captured the state championship and are now playing in the semi-finals of an open invitational tournament of 32 teams.

Two officers of the section have recently received new assignments. Cecil McCarty, chairman, has been transferred from the refinery engineering organization to the engineering department at the Arthur-Magna Mills.

John Boyd, vice chairman, has been promoted to supervisor of testing at Sperry-Utah Engineering Laboratory.

. . . San Antonio—Section chairman R. W. Worrick and member W. T. Smith completed a three-week course in SQC held in Dayton, Ohio. The course was made available by the Air Force Institute of Technology in cooperation with Ohio State University.

. . . San Francisco Bay Area—The section participated in the 11th Industrial Engineering Institute sponsored by the University of California at Berkeley and the First Annual Reliability Seminar at Stanford Research Institute jointly sponsored by IRE Professional Group on Reliability and the section.

. . . South Bend-Mishawaka—The section is bidding a sad farewell to several of its most active members. Robert Fitzgibbons, a past chairman, has left his position as QC engineer with the Bendix Missile Section to take a position with the Raytheon Corp. in New York. Don Ortberg, formerly QC director of Whirlpool Corp. has moved to the Leejohnson Co., Evansville, Ind. Gaspar Takach, former chief inspector at U. S. Rubber Company, is now with Aerojet-General Corp. Raleigh R. Merrell, QC engineer at ASR-Kingsbury Corp., will head a new QC department at Chrysler Corporation's Kokomo, Ind. plant. Good luck to all in their new jobs.

Wayne Miller, junior past chairman of the section, recently left for Sao Paulo, Brazil where he will be quality manager of the new Bendix-Westinghouse brake factory. He was chief inspector of Bendix's automotive division in South Bend until shortly before his transfer to Brazil.

. . . Syracuse—Several months ago Edwin H. Amedon became QC manager of the Axle Transmission Division, Chrysler Corp. He was formerly Quality manager at New Process Gear Corp. His membership has been transferred to the Detroit section.

. . . Toronto—Wm. Foskett, section chairman, has accepted a position as QC manager and chief inspector of Servo Mechanisms (Canada), Ltd. in Rexdale. He was formerly with Flight Refueling (Canada), Ltd. We wish him every success in his new venture.

. . . Tucson—Congratulations to section chairman Mark Manning on his recent marriage to Miss Beverly Bates.

. . . Tulsa—James Perry has been transferred to the Rocketdyne plant in Neosho, Mo. as an ordnance department inspector.

. . . Utica—Howard L. Berke, QC engineering supervisor at General Electric Co., is teaching a 12-week QC course at the Mohawk Valley Technical Institute.

Robert Clonan has been appointed to the post of assistant coordinator of programs for the gifted child in Oneida County.

ASQC Announces

Advancements and New Members

ADMISSIONS TO THE GRADE OF ENROLLED STUDENT
(as of Jan. 24, 1959)

GIANNETTI, ARTHUR A. JR., Medford, Mass.

ADMISSIONS TO THE GRADE OF ASSOCIATE MEMBER
(as of Jan. 24, 1959)

ARTZ, THOMAS M., Columbus, Ohio
BEARDSLEY, WALTER F., West Haven, Conn.
BERG, WAYNE L., Akron, Ohio
BLAKE, DONALD G., Lexington, Mass.
BROCKMAN, HERMAN B., Cambridge City, Ind.
CALLAHAN, CLARENCE L., Detroit, Mich.
CALONGE, HERMAN W., Connersville, Ind.
CHIRICO, ANTHONY J., West Reading, Pa.
CIMINELLO, ROBERT L., Columbus, Ohio
COOK, JAMES A. JR., Barberton, Ohio
CUMMINGS, CLIFFORD N. JR., Jackson, Mich.
CURTIS, WILLIAM E., Akron, Ohio
FELTZ, ARNOLD A., Connersville, Ind.
FENWICK, JOSEPH E., Chicago, Ill.
GABRIEL, LAWRENCE N., Chicago, Ill.
GRAY, ROBERT K., Connersville, Ind.
HANSEN, FREDERICK W., Hollistor, Mass.
HEWITT, THOMAS P., Bridgeport, Conn.
HUBER, WILLIAM, Connersville, Ind.
JACOBS, ROGER E., Ortonville, Mich.
JESTER, RALPH G., Brookville, Ind.
JOHNSON, LEN JR., Connersville, Ind.
JOHNSON, OWEN C., Connersville, Ind.
JOHNSON, VERNON E., Connersville, Ind.
KANE, ROBERT P., Trenton, Mich.
KELLY, EDWARD C., Connersville, Ind.
KEMP, THOMAS H., Richmond, Ind.
KING, LLOYD, Connersville, Ind.
KITCHEN, DONALD F., McComb, Ohio
KOBYCENSKY, GEORGE E., Connersville, Ind.
LOBART, WILLIAM, Detroit, Mich.
LOWE, JAY S., Birmingham, Mich.
MANGES, JAMES E., East Sparta, Ohio
MARMONT, CECIL J., Mt. View, Cal.
MARRA, ANTONIO C., Cleveland, Ohio
MARTENS, HEDWIG K., Woodmont, Conn.
MAUCH, WILLIAM K., Elida, Ohio
MEIERHOFER, WALTER G., Zurich 10/49, Switzerland
MELHORN, CLARENCE SR., Connersville, Ind.
NANJAPPAN, MURUGAPPAN, Philadelphia, Pa.
NICHOLAS, DONALD E., Akron, Ohio
PETERSEN, JOHN A., Connersville, Ind.
PORTER, MARVIN G., Chicago, Ill.
REISS, BENJAMIN B., Bronx, N. Y.
RICHARDS, ROBERT W., La Mesa, Cal.
ROWELL, GEORGE H., Tell City, Ind.
SEEGERS, MARTIN P., Elmont, L. I., N. Y.
SPRING, GERALD R., New Philadelphia, Ohio
STUDOR, DOUGLAS A., Redwood City, Cal.
SWANSON, ELMER L., Chicago, Ill.
THIBODEAR, GUY L., Hazel Park, Mich.
TRIPP, WILLIAM B., Connersville, Ind.
VAIL, WILLIAM JR., Connersville, Ind.
VRANA, RANDOLPH L., San Mateo, Cal.
WELLING, LEO J. JR., Wisconsin Rapids, Wis.
WHEELER, PAUL D., Kingsport, Tenn.
WILLIAMS, LESLIE T., Cranston, R. I.
ZIEGLER, WILLIAM T., Reading, Pa.

ADMISSIONS TO THE GRADE OF MEMBER
(as of Jan. 24, 1959)

ACKERMAN, MARVIN, Wellsboro, Pa.
AHRENS, ARTHUR A., Encino, Cal.
ALLISON, ROY G., Spencerport, N. Y.
ANDERSON, BYRON O., Tulsa, Okla.
BAILEY, BYRON C. JR., Parkersburg, W. Va.
BATLEY, GEORGE H., Corning, N. Y.
BERLYN, MARTIN J., Montreal, Que., Canada
BLACKWELDER, MAURICE W., Riverside, Cal.
BLAISDELL, PERCY N., Phoenix, Ariz.
BORGSTADT, ROY S., Omaha, Neb.
BOYD, CLAUDE E., San Diego, Cal.
BRADLEY, GEORGE G., Sudbury, Mass.
BRANSFORD, THEODORE D., Barberton, Ohio

(Continued on page 42)

University of Michigan Non-Credit Courses

A summer program of intensive non-credit courses for practicing engineers and scientists will be offered by the University of Michigan, Ann Arbor, Mich.

A course entitled "Introduction to Standard Methods of Numerical Analysis" will be conducted June 15-26.

The following courses will be held June 29-July 10: computer programming and artificial intelligence; advance numerical analysis; advanced theory of the logical design of digital computers; introduction to digital computer engineering; and foundations and tools for operations research and the management sciences.

Additional information regarding these courses may be obtained by writing to: R. E. Carroll, Coordinator of Engineering, Summer Conferences, University of Michigan, Ann Arbor, Mich.

clinics, conferences, and courses

MAY

. . . **2**—All-Day Conference, Cornell University, Ithaca, N. Y., cosponsored by the Binghamton and Corning-Elmira sections of ASQC, contact A. P. Stergion, Corning Glass Works, Corning, N. Y.

. . . ***11-13***—Joint Automation Conference, Pike Congress Hotel, Chicago, Ill., sponsored by ASME, AIEE, IRE, contact F. D. Snyder, c/o Westinghouse Electric Corp., 40 Wall St., New York 5, N. Y.

. . . ***14-15***—7th Annual Meeting, Operations Research Society of America, The Shoreham Hotel, Washington, D. C.

. . . ***14-16***—10th Annual AIIE National Conference and Convention, Biltmore Hotel, Atlanta, Ga., contact America Institute of Industrial Engineers, P.O. Box 5255, Station E, Atlanta 7, Ga.

. . . ***14-23***—The International Petroleum Exposition, Exposition Grounds, Tulsa, Okla., register at Registration Booth.

. . . ***21-23—Workshop-Seminar on Management of Quality Control, Cleveland Hotel, Cleveland, Ohio, sponsored by ASQC.*** ***(See page 40 of this issue.)***

. . . ***25-27—13th Annual Convention and National All-Industry Quality Control & Production Exposition, Public Auditorium, Cleveland, Ohio, sponsored by ASQC.***

JUNE

. . . ***8-July 17***—Southern Regional Graduate Summer Session in Statistics, North Carolina State College, Raleigh, N. C., contact F. E. McVay, Dept. of Experimental Statistics, North Carolina State College, Raleigh, N. C.

. . . ***9-19***—Design of Experiments Short Course, Purdue University, Lafayette, Ind., contact Prof. Charles R. Hicks, Purdue University, Lafayette, Ind.

. . . ***9-19***—Advanced QC Short Course, Purdue University, Lafayette, Ind., contact Prof. Irving W. Burr, Purdue University, Lafayette, Ind.

. . . ***15-27***—20th Annual Management Course, State University of Iowa, Iowa City, Iowa, contact J. Wayne Deegan, 122 Engineering Building, State University of Iowa, Iowa City, Iowa.

. . . ***16-19***—Annual Industrial Engineering Seminars, Cornell University, Ithaca, N. Y., contact Andrew Schultz, Jr., Dept. of Industrial and Engineering Administration, Upson Hall, Cornell University, Ithaca, N. Y.

. . . ***20***—Six-day intensive course in QC for the Graphic Industries, Rochester Institute of Technology, Rochester, N. Y., contact Harold Kentner, Asst. Director Extended Services, Rochester Institute of Technology, 65 Plymouth Ave. So., Rochester, N. Y.

. . . ***22-26***—Symposium on Education in Materials, (ASTM Annual Meeting), Atlantic City, N. J., sponsored by ASTM and ASEE, contact ASTM, 1916 Race St., Philadelphia 3, Pa.

. . . ***29-July 10***—Foundations and Tools for Operations Research and the Management Sciences, University of Michigan, Ann Arbor, Mich., contact R. E. Carroll, Coordinator of Engineering, Summer Conferences, University of Michigan, Ann Arbor, Mich.

AUGUST

. . . ***17-27***—12th Annual Intensive Course in QC by Statistical Methods, University of Michigan, Ann Arbor, Mich., contact Prof. C. C. Craig, 106 Rackham Building, Ann Arbor, Mich.

Brookshire, John V. Jr., Anderson, S. C.
Bryson, Roy W., Baltimore, Md.
Bunnell, Willard W., Rochester, N. Y.
Camarota, Anthony R., Wayland, Mass.
Carreau, David W., Mystic, Conn.
Castle, Floyd, Smyrna, Ga.
Chelgren, David O., Scottsdale, Ariz.
Cich, Everett R., Madison, Wis.
Clark, Jack H., Dallas, Tex.
Coburn, James L., Ft. Worth, Tex.
Colanchick, Alton E., Two Rivers, Wis.
Compton, John, London, Ont., Canada
Cornish, Hubert T., Cincinnati, Ohio
Coutoumanos, Andrew J., Sacramento, Cal.
Crandall, Boyd L., Haddonfield, N. J.
Crosby, George S., Lexington, Mass.
Crossman, William A., Fairfield, Conn.
Daly, William G., Los Alamitos, Cal.
Diamond, George A., Oak Park, Ill.
Davis, James M., Pittsfield, Mass.
DeBusk, Ralph E., Kingsport, Tenn.
DiPillo, Pasquale J., Paterson, N. J.
Doi, Arthur N., Sacramento, Cal.
Donelan, Thomas F., Nedrow, N. Y.
Donkle, Melvin C., Madison, Wis.
Doppler, Albert J., Natick, Mass.
Easterly, Karl H., Phoenix, Ariz.
Eickenberg, Frederick, Largo, Fla.
Eitelman, Harry K., Schenectady, N. Y.
Evans, Philip A., Westwood, Mass.
Ewing, Clark W., Parkersburg, W. Va.
Fenoulhet, Brian L., Montreal, Que., Canada
Finlay, George J., La Puente, Cal.
Fox, Barbara, Parsippany, N. J.
Frischman, Thomas A., Solon, Ohio
Geyer, Howard W., Cleveland, Ohio
Glovin, Paul N., Brooklyn, N. Y.
Gorman, John W., Whiting, Ind.
Gowdey, Philip E., Needham, Mass.
Gray, Cecil C., Wadsworth, Ohio
Hamilton, John D., Akron, Ohio
Hansen, Joseph J. Jr., Cambridge, Mass.
Harss, George H., Manchester, Conn.
Hay, William C., Elgin, Ill.
Hayes, Paul M., Beverly, Mass.
Haynes, James L., Kansas City, Mo.
Higgs, Richard N., San Diego, Cal.
Hodge, Thomas R., Carbon, W. Va.
Holt, James E., Huntsville, Ala.
Horton, William R., Canton, Ohio
Huffman, Daniel E., Phoenix, Ariz.
Hunsberger, Neville, Williamsville, N. Y.
Hurd, Arthur B., Ravenna, Ohio
Huth, George F. Jr., Esopus, N. Y.
Kahn, William J., Stamford, Conn.
Kent, Matthew T., Chicago, Ill.
Kleid, Robert E., Trumbull, Conn.
Klein, William G., Newton Center, Mass.
Klockenkemper, Martin J., San Antonio, Tex.
Knight, Robert F., St. Petersburg, Fla.
Koch, Joseph A., Kingsport, Tenn.
Konois, Thomas J., Homestead Park, Pa.
Koulaxizes, Spiro D., San Diego, Cal.
Kruser, Herbert W., Mineola, N. Y.
Kucera, John F., Lancaster, Pa.
Landman, Leon, Boston, Mass.
Landreth, Edgar D., Waterville, Me.
Larsen, Lawrence P., Salt Lake City, Utah
Lecklider, Robert L., Phoenix, Ariz.
Levine, Isadore, Bridgeport, Conn.
Loesch, Joseph, Tucson, Ariz.
Loper, Donn W., Scottsdale, Ariz.
Lowry, Leon, Dayton, Ohio
Lozo, Keith G., Norco, Cal.
Maclellan, John Peter, Melbourne, Australia
Martin, Donald A., Wadsworth, Ohio
Mathewson, William C., Phoenix, Ariz.
Maurer, Leon W., Vienna, W. Va.
Mazurek, Richard R., Brantsford, Ont., Canada
McKittrick, Glenn W., Aurora, Ill.
McPherson, David R., San Mateo, Cal.
Meunier, Frederick A., Cleveland, Ohio
Mitchell, Robert N., San Pablo, Cal.
Monfort, Franz, V. J., Heusy-Verviers, Belgium
Moorehead, Wilbur L., San Bernardino, Cal.
Myers, Samuel M., Bristol, Tenn.
Myers, William H., Pittsfield, Mass.
Nahm, William H., Orlando, Fla.
Neary, Joseph P., Carneys Point, N. J.
Newquist, Harvey P. Jr., Utica, N. Y.
Nichols, Edward H., Encino, Cal.
Nimmer, Edward H., West Allis, Wis.
Norquist, Warren E., Athens, Ga.
Orr, Edward J., Bristol, Tenn.
Parrill, Richard F., Schenectady N. Y.
Patry, Paul R., Montreal, Que., Canada
Paulding, William G., Kingston, N. Y.
Pebard, Desire J. Jr., Denver, Colo.
Poulsen, George M., St. Paul, Minn.
Pruett, Virgil N., Garden City, Mich.
Reagan, Paul W., Seattle, Wash.
Rector, John E., Parkersburg, W. Va.
Rice, Hugh, Akron, Ohio
Roberts, Conley J., Phoenix, Ariz.
Robinson, Anthony J., Beacon, N. Y.
Rolly, William J., Belmont, Cal.
Rudis, Rupert J., Sacramento, Cal.
Sarwine, Henry A., Arcadia, Cal.
Sasaki, Robert S., Sacramento, Cal.
Schultz, Herbert E., Ann Arbor, Mich.
Schultz, John J., Greensburg, Pa.
Schuman, Richard E., Decatur, Ill.
Scofield, Ella B., Tucson, Ariz.
Sellick, Lawrence A., Ottawa, Ont., Canada
Setterberg, John R., Oklahoma City, Okla.
Simpson, Walter W., Trumbull, Conn.
Spriggs, Richard M., Northfield, Ohio
Stavrakas, Evangelds J., Foxboro, Mass.
Sterling, Lester C., Pittsfield, Mass.
Stolle, Richard, Wrt. Patterson AFB, Ohio
Story, Paul W., San Diego, Cal.
Stotts, Roger B., London, Ont., Canada
Thompson, Fred K., Louisville, Ky.
Todd, Harry T., Salt Lake City, Utah
Tust, Robert A., Egypt, Pa.
Vickers, Delmar C., Decota, W. Va.
Wameling, Francis C., Utica, N. Y.
Ward, William H., Phoenix, N. Y.
Way, Eugene V., Phoenix, Ariz.
Weaver, Otto Jr., Kingston, N. Y.
Whalen, Richard N., Lima, Ohio
Wilcox, Jack F., Carmichael, Cal
Woglom, William H., Norwalk Conn.
Wood, Leo W., Salt Lake City, Utah
Woozley, Harry D., Barberton, Ohio

Product Education Service

These advertisers provide educational information on their products, expanding the services of your journal, *Industrial Quality Control.*

Their support is twofold. First they place the latest information on product development at your finger tips. In addition their purchase of advertising space supports your Society and this publication. Continue to advance your Society by using their products and services and encourage others to do so. They all merit your consideration.

When writing or talking to advertisers to inquire about their products, always remember to say you saw their ad in *Industrial Quality Control.*

Advertisers in this issue

A-1, **Acme Scientific Co.**.....39
A-2, **Airborne Instruments Laboratory, A Division of Cutler-Hammer, Inc.**..... 4
A-3, **American Optical Co.**.....31
A-4, **B. C. Ames Co.**..... 1
A-5, **Comtor Co.** 33
A-6, **DoALL Co.** 23
A-7, **Elliott Service Co., Inc.**.....18, 19
A-8, **General Transistor Corp.**.....IBC
A-9, **W. R. Grace & Co., Davison Chemical Division** 21
A-10, **Japanese Standards Assoc.**.....20
A-11, **Jones & Lamson Machine Co.** 15, 17
A-12, **Lightning Calculator Co.**.....16
A-13, **Monroe Calculating Machine Co., Inc.**.....37
A-14, **Texas Electronic Products Corp.** .....IFC
A-15, **Veeder-Root, Inc.** 30, 35
A-16, **Carl Zeiss, Inc.**.....OBC

Advertisers in previous issues of Volume XV

Allied Radio Corp.
Bell Telephone Laboratories, Inc.
Cadillac Gage Co.
Curtiss-Wright Corp.
Custom Scientific Instruments, Inc.
Eastman Kodak Co.
Federal Products Corp.
C. E. Foster Gage Corp.
Karl Heitz, Inc.
Invo Spline, Inc.
Interscience Publishers, Inc.
Lincoln Gage Co.
Lufkin Rule Co
Sheffield Corp.
United Air Lines
Unit Process Assemblies, Inc.
John Wiley & Sons, Inc.

Mail the handy coupon below to obtain further information about any of the items appearing in advertisements or new products and new literature described in the "What's New?" department, pages 16-22 & 31.

INDUSTRIAL QUALITY CONTROL
Room 6197 Plankinton Building
161 West Wisconsin Avenue
Milwaukee 3, Wisconsin

Att.: Product Education Service, 459

Please send me further information as indicated below:
(mark key number of advertisements, new products or literature)

ADVERTISERS	NEW PRODUCTS	NEW LITERATURE
A— _____	P— _____	L— _____
A— _____	P— _____	L— _____
A— _____	P— _____	L— _____
A— _____	P— _____	L— _____

Name _____

Address _____

_____

City _____ Zone No. _____ State _____

ADVANCEMENTS TO THE GRADE OF SENIOR MEMBER
(as of Jan. 24, 1959)

Bernazza, Leonard D., Poughkeepsie, N. Y.
Black, Jesse I., Lakewood, Cal.
Blue, Carson A. Jr., Winter Park, Fla.
Burchfield, Delmas D., Florissant, Mo.
Coburn, James L., Ft. Worth, Tex.
Coughlin, John W., Rochester, N. Y.
Crandall, Boyd L., Haddonfield, N. J.
Crutchfield, B. Walter, Hendersonville, N. C.
Delaney, Francis H., Wappingers Falls, N. Y.
Lamoy, George V., Syracuse, N. Y.
Mitchell, Robert N., San Pablo, Cal.

ADMISSIONS TO THE GRADE OF ENROLLED STUDENT
(as of Feb. 24, 1959)

Blaser, Ellen, Davenport, Iowa
Edmunds, Norma J., St. Petersburg, Fla.
Gurney, Allan B., Haddon Hghts., N. J.
Palmer, Thomas, Amsterdam, N. Y.
Rigterink, John W., Palo Alto, Cal.

ADMISSIONS TO THE GRADE OF ASSOCIATE MEMBER
(as of Feb. 24, 1959)

Atkinson, James E., Chicago, Ill.
Barnett, Wallace R., Chicago, Ill.
Baxter, Donald S., Colonial Heights, Va.
Beck, William C., Huntsville, Ala.

BEILFUSS, WALTER H., Chicago, Ill.
BERGESON, ALMO O., Seattle, Wash.
BRAMBLE, CLAUDIA C., St. Petersburg, Fla.
CRESSMAN, HARRY E., Chattanooga, Tenn.
CURYLO, GENE J., Chicago, Ill.
DICKEY, DONALD R., Ravenswood, W. Va.
DOS SANTOS, MIGUEL C., Lisbon, Portugal
GODSEY, JOSEPH C., Richmond, Va.
HOHN, THOMAS J., Muskogee, Okla.
HOLLISTER, DALE S., Ballston Lake, N. Y.
HURST, HAROLD L., Chicago, Ill.
IVERSON, JERRY R., Franklin Pk., Ill.
JACKSON, CASIMIR C., Erie, Pa.
JACKSON, FREDERICK R., Newark, Ohio
KROL, WALTER J., Chicago, Ill.
KRZYZEWSKI, KARL P., Jersey City, N. J.
LA GROU, RAYMOND L., Buffalo, N. Y.
LIENHARDT, WINFIELD S., Rahway, N. J.
LIKOSAR, JOHN V., Hillside, Ill.
MAGNUSON, ROBERT E., Niles, Ill.
MCDOWELL, JACK L., Zion, Ill.
MOORE, FRED C., Chicago, Ill.
OATMAN, LESTER H., Lima, Ohio
PARTIDOS, ARIS C., Redwood City, Cal.
PAWLICK, STANLEY T., Chicago, Ill.
PHILLIPS, DARWIN M., Indianapolis, Ind.
PIPENHAGEN, HERBERT C., Chicago, Ill.
POLASKI, RAY A., Chicago, Ill.
POWELL, ROBERT M., Taylors, S. C.
ROBEY, DELBERT J., Lima, Ohio
RODRIGUEZ, LOUIS A., Chicago, Ill.
RUDLOFF, RAYMOND C., Texas City, Tex.
RUSH, ROBERT G., W. Islip, L. I., N. Y.
SCHNEIDER, KENNETH F., Kenmore, N. Y.
SCHOOF, RAYMOND C., Northville, Mich.
SHAHANI, ARJAN K., Surrey, England
SIMS, PARKER D., Lexington, Ky.
SPOULA, RICHARD M., Chicago, Ill.
STECH, JAMES E., Lima, Ohio
SWAN, ERNEST F., Burbank, Cal.

ADMISSIONS TO THE GRADE OF MEMBER
(as of Feb. 24, 1959)

ACKERMAN, DONALD I., St. Petersburg, Fla.
ADAMS, EDWARD, Cleveland, Ohio
AIKEN, JOHN S., Kannapolis, N. C.
ALBRECHT, EDMUND H., Parkersburg, W. Va.
ANDERSON, DAVID P., Newark, Ohio
ANDERSON, DAYTON L., Minneapolis, Minn.
ANDERSON, WALTER J., Tucson, Ariz.
ARONOWITZ, BERNARD, Bloomfield, N. J.
ASMUS, KARL E. JR., Syracuse, N. Y.
BAGGOT, THOMAS A., Kingston, N. Y.
BALABAN, HAROLD S., Washington, D. C.
BELIVEAU, ARMAND J., Salem, Mass.
BELTRAN-FORTUNY, RAFAEL, Mexico, Mexico
BERGQUIST, EDWARD A., Ravenswood, W. Va.
BETSILL, DOYLE G., Ft. Worth, Tex.
BINGHAM, JOHN T., Sacramento, Cal.
BLANKENSTEIN, EDWARD E., Indianapolis, Ind.
BLISS, HARLAN B., Huntingdon, Pa.
BLISS, HENRY O., Santa Ana, Cal.
BOLGER, JOSEPH M. JR., Utica, N. Y.
BONOME, JOSEPH, New York, N. Y.
BOSTON, FRANK E., Ravenna, Ohio
BOYD, RUSSELL G., Tucson, Ariz.
BRAND, WARREN E., Marion, N. C.
BREUER, EARL H., Wichita, Kans.
BROCE, FOSTER E., Indianapolis, Ind.
BROWN, CECIL D., Birmingham, Ala.
BROWN, DANIEL, Kingston, N. Y.
BROWN, PERRY H., Albany, N. Y.
BROWN, ROBERT S., Eau Gallie, Fla.
BRYCK, FRED J., Minneapolis, Minn.
BUBSER, JOHN E., Hamburg, Pa.
BULLOCH, BEN H., Dahlonega, Ga.
BURTON, JAMES E., San Bernardino, Cal.
BUSKILL, NORMAN G. JR., Newnan, Ga.
BUSTEED, WILFRED J., Duarte, Cal.
CAHEN, ALFRED B., Cleveland, Ohio
CALDWELL, JOSEPH R., Sacramento, Cal.
CAMPANELLI, GEORGE D., Middlebranch, Ohio
CAREY, EDWARD A. JR., Kingston, N. Y.
CARTER, WILLIAM A., Hershey, Pa.
CHAMBERS, CHARLES D., Chicago, Ill.
CLAYTON, ANTHONY R., Getzville, N. Y.
CLOWERS, CECIL E., Huntsville, Ala.
COCHRAN, FRED L., Rialto, Cal.
CONGER, GLENN L., Sacramento, Cal.
CONWAY, J. KENNETH, Cochituate, Mass.
COON, JOHN B., Kingston, N. Y.
CORDER, JOSEPH T., San Diego, Cal.
COX, CHARLTON R., Bellevue, Wash.
COYLE, KENNETH S. JR., Pittsfield, Mass.
CRAWFORD, ADNA R., N. Syracuse, N. Y.
CROMWELL, CARROLL W., Asheville, N. C.
CROWTHER, CHARLES A., Syracuse, N. Y.
CULVER, LEONARD O., Santa Clara, Cal.
CUNNINGHAM, FILLMORE F., Parkersburg, W. Va.
CUSENBERRY, THERON B., Ft. Wayne, Ind.
DAMEROW, RICHARD F., Uniontown, Ohio
DAVIS, JAMES F., Akron, Ohio
DEAN, LLOYD A., Venice, Cal.
DEMBOSKI, JAMES A., Tivoli, N. Y.
DOCK, JAMES P., Hawthorne, N. J.
DOHERTY, JAMES A., Fullerton, Cal.
DOHI, SEIICHI, Tokyo, Japan
EICHENSEER, RICHARD J., Richardson, Tex.
EILERS, GILBERT A., Houston, Tex.
EGGIMANN, ERVON J. H., Westfield, N. J.
ERLANDSEN, CHARLES F., Lynchburg, Va.
EVANS, EUGENE W., La Habra, Cal.
FAIRMAN, ARTHUR, Island Park, N. Y.
FALCONE, ANTHONY C., Buffalo, N. Y.
FELLEISEN, LEWIS K., Amherst, N. Y.
FELLNER, EUGENE L., Tucson, Ariz.
FORBES, WINSTON W., Venice, Cal.
FORD, WILLIAM E., Cuyahoga Falls, Ohio
FOSTER, LEROY E., Albuquerque, N. M.
FOY, WILLIAM J., Citrus Heights, Cal.
FRANKEL, IRWIN, N. Tonawanda, N. Y.
FREEMAN, LOWELL C. JR., Benton Harbor, Mich.
FRICK, GAYLE C., Osseo, Minn.
GALLAUDET, EARLE L., Hawthorne, Cal.
GEVIRTZ, DON L., Los Angeles, Cal.
GHIGLIO, CHARLES G., Hartford, Conn.
GIFFORD, JOHN H., Akron, Ohio
GILCHRIST, EDWARD A., Wayne, N. J.
GIVENS, HAROLD C., Sistersville, W. Va.
GLEASON, GEORGE J., Pittsfield, Mass.
GOBER, LONZO M., Ft. th, Tex.
GORSKY, DANIEL, Elizabethtown, Pa.
GOULD, EDSON B. III., Los Angeles, Cal.
GRANDISHER, HARRY R., Santa Monica, Cal.
GRAVES, JOE E., Akron, Ohio
GRAY, GLEN A. JR., Akron, Ohio
GRAY, RALPH W., West Covina, Cal.
GREEN, FRANCIS J., St. Paul, Minn.
GREEN, JOHN R., Youngstown, Ohio
GREENAWALT, DONALD R., Tucson, Ariz.
GREENBERG, JACK, Providence, R. I.
GRIM, JOHN E. JR., Akron, Ohio
GROUIX, ROY W., Kalamazoo, Mich.
HALL, WILLIAM B., Narrows, Va.
HANDA, TOGO, Yamaguchi, Japan
HANNA, WILLIAM C., Hawthorne, Cal.
HARNED, WILLIAM L., Kingsport, Tenn.
HARTMAN, ELLIS W. JR., Harrisburg, Pa.
HARVEY, ARTHUR E. JR., Athens, Ala.
HATHCOCK, HERBERT S., Huntsville, Ala.
HAWKING, NORMAN E., Fullerton, Cal.
HEATON, FRANCIS W., Maplewood, Mo.
HEIKIN, JACOB, Harrisburg, Pa.
HERMANSADER, ROBERT D., Miami, Fla.
HEROY, RICHARD J., New Paltz, N. Y.
HESS, JAMES E., State College, Pa.
HICKS, GARRETT T., Huntsville, Ala.
HIETT, TEE H. JR., Atlanta, Ga.
HILMAN, JULIAN, Menlo Park, Cal.
HITCH, VERNON K., Akron, Ohio
HITCHCOCK, RALPH R., Springville, Utah
HOFFMAN, FRANK H. JR., San Gabriel, Cal.
HOFFMAN, LORIN A., Egypt, Pa.
HOLGATE, WILBUR C., Mogadore, Ohio
HOLLIDAY, KENNETH E., Dayton, Ohio
HOOD, ARTHUR F., N. Quincy, Mass.
HOOPER, RAY L., Brevard, N. C.
HORIKAWA, KAZUO, Tokyo, Japan
HUGHES, RONALD D., Rock Island, Ill.
HULKA, HAROLD L., Tamaqua, Pa.
HUYLER, LEE E. JR., Syracuse, N. Y.
ISHIKAWA, HIROHABU, Yokohama, Japan
JEFFREY, FRANK, Minneapolis, Minn.
JOHNSON, CLARENCE L., Lee, Mass.
JOHNSON, DONALD A., Schenectady, N. Y.
JONES, RUTH M., Portland, Ore.
JORDAN, ANTHONY D., Chicago, Ill.
KAGEYAMA, FUSATARO, Amagasakishi, Japan
KAHLER, PAUL R., Hartville, Ohio
KAMINSKY, MICHAEL JR., Minneapolis, Minn.
KANDRATAVICH, ROBERT J., McKeansburg, Pa.
KEAN, HERBERT P., Bloomfield, N. J.
KELLEY, HERBERT D., Akron, Ohio
KELLY, JOHN J. SR., Huntsville, Ala.
KENNELLY, WILLIAM J., Riverside, Cal.
KERCIMAR, FRANCIS C., Allentown, Pa.
KEYS, ALDEAN, Portland, Ore.
KILLION, LAWRENCE E., Albuquerque, N. M.
KOMAZAWA, KOICHI, Yokohama, Japan
KOVARIK, EUGENE J., Cincinnati, Ohio
KRALEY, JOHN, Portland, Ore.
KREUEGER, RUSSELL A., San Diego, Cal.
KRITZER, OSCAR J., Los Angeles, Cal.
KUBRICH, STEPHEN, Garland, Tex.
KURRASCH, KENNETH J., Minneapolis, Minn.
LABATE, ANTHONY P., Easton, Pa.
LAFFERTY, JOHN S., Broomall, Pa.
LANCASTER, ERROLL J., Anaheim, Cal.
LANDO, JOSEPH P., E. Syracuse, N. Y.
LANYON, ROBERT D., Parkersburg, W. Va.
LAUNDRIE, ROBERT W., Akron, Ohio
LAUWERS, RICHARD E., Orrville, Ohio
LAWHERN, OLLIE M., Palo Alto, Cal.
LAWSON, JOHN R., Parkersburg, W. Va.
LE BEL, R. V., Dallas, Tex.
LEE, CHARLES D., Shelby, N. C.
LINCOLN, LESLIE S. JR., Brooklyn, N. Y.
LINK, CECIL H., Irving, Tex.
LONG, HARRY, Hasbrouck Heights, N. J.
MAIN, EMMETT A., Tulsa, Okla.
MARTIN, ALFRED M., Granada Hills, Cal.
MARTIN, JAMES B., Indianapolis, Ind.
MATTHEWS, FREDERIC L., Moorestown, N. J.
MATTSON, FRANK R., Fair Oaks, Cal.
MCDONALD, CHARLES W., Rhinebeck, N. Y.
MCGOGRTY, JAMES E., Albuquerque, N. M.
MCGRAUGH, FRANK J., Tucson, Ariz.
MCKINLEY, MARVIN M., Albuquerque, N. M.
MCOWEN, CLYDE, Tucson, Ariz.
MELICK, E. STANLEY, Elmore, Ohio
MERDINGER, EGON H., Ridgewood, N. J.
MEZZENGA, AUGUST J., Minneapolis, Minn.
MIKULKA, BOHUSLAV E., Diboll, Tex.
MILNER, ROBERT R., Corona, Cal.
MORISON, JOHN M., Randolph, Mass.
MORROW, LEE E., Pleasure Ridge Pk., Ky.
MORSE, RUSSELL C., Hammond, Ind.
MOSCINSKI, JOSEPH F., Woonsocket, R. I.

(To be continued)

SOMEBODY GOOFED

Our apologies to those ASQC members whose names were garbled on the March issue mailing labels.

Some of you who are familiar with punched-card equipment may have recognized that our service organization put the wrong programming board into the label printer. The board used for ASQC causes 24 characters of the name field to print on the labels; the board actually used for our March labels was that of another publication which prints only 15 characters in the name field and six characters from the last six columns of the IBM card. On our cards the last six columns carry each member's serial number. This is why everyone's name was cut off after 15 characters and replaced by his serial number.

So to those members whose names are longer than 15 characters and whose labels hence were goofed-up, our sincere apologies. There's nothing wrong with our records; this was strictly an operating bloomer.

POSITIONS AVAILABLE

Address all replies to box number references to: American Society for Quality Control, Room 6197 Plankinton Bldg., 161 W. Wisconsin Ave., Milwaukee 3, Wis.

Quality Standards Engineer to assume responsibility for quality standards and control. Expanding ten year old company engaged in development and production of thin film optics and related products. Northern California location one hour from metropolitan center. Ability to understand all characteristics of spectrophotometers and other related test equipment and ability to communicate clearly are requisites. Experience in optics not essential. Prefer college graduate with QC experience. Salary open. Please reply to Box 15X1.

STATISTICAL QUALITY CONTROL ENGINEER

First line diversified chemical company seeking an Assistant Quality Control supervisor to supervise SQC technicians in the installation, administration and extension of SQC programs. Applicant should have an engineering degree in IE, Me or ChE with at least two years' experience in SQC techniques. Eastern Pennsylvania location.

Please send resume and salary requirements to box 15X2

QUALITY CONTROL ENGINEER

An established paper company in the East with expanding manufacturing facilities presents an excellent job opportunity for a chemical, mechanical or electrical engineer interested in developing in the field of quality control.

(Concluded on page 44)

(Continued from page 43)

Position demands personable, tactful, individual with 2-3 years experience and willingness to progress. Assignments relate to test and inspection; raw material, process and product control; and special project studies. Kindly submit resume and salary requirements to Box 15X3.

POSITIONS WANTED

Address all replies to box number references to: American Society for Quality Control, Room 6197 Plankinton Bldg., 161 W. Wisconsin Ave., Milwaukee, Wis.

Quality Control Engineer desires administrative position in statistical quality control, preferably in the Western States. Age 31, senior member ASQC. Seven years experience statistical technician, Asst. Chief Quality Control, and Chief Quality Control primarily in the electronics field. Broad educational background including Statistical Quality Control, Statistics, Electronics, and Mathematics—BA degree 1951. Please reply to Box 15K1.

QUALITY CONTROL ENGINEER
Desires to re-locate. (Texas, Okla., Louisiana, Arkansas). Ten years Quality Control experience in Aircraft Industry. Eight of these ten in Statistical Quality Control, two years as SQC Supervisor. Thoroughly experienced in SQC installation and administrative methods, sampling, control charts, and diagnostic techniques. Please reply to Box 15K2.

QUALITY CONTROL GRADUATE ENGINEERS

Honeywell's balanced diversity and continuing growth have created excellent openings for Quality Control Engineers in many of its divisions.

B.S. degree in E.E., M.E., I.E. or science required. Math background should include calculus. Some openings require a strong electronics background, others require semiconductor experience.

Positions offer excellent opportunities in Minneapolis for work on civilian or military products. Replies held confidential. Send complete resume of academic and industrial experience to

B. T. CASWELL
Dept. IQC
Personnel Department
Minneapolis-Honeywell
Regulator Co.
2753 Fourth Avenue South
Minneapolis 8, Minnesota

HONEYWELL
First in Control

OPPORTUNITIES
. . . With a Growth Company

QUALITY CONTROL SUPERVISOR
EE or ME with some QC experience and supervisory background in electro-mechanical equipment.

QUALITY CONTROL ANALYST
3 to 5 years experience in sensitizing QC for phototest analyst position.

FIELD REPRESENTATIVE (TECHNICAL)
3 to 5 years experience in sensitized products manufacture.

HALOID XEROX

Kindly submit resume and salary requirements to:

FRED A. WETERRINGS
INDUSTRIAL RELATIONS
HALOID XEROX INC.
2-30 Haloid St.
Rochester 3, N. Y.

Opportunities
. . . With A Growth Company

CELANESE has challenging opportunities at their Virginia Location for graduate chemists or chemical engineers with the following qualifications:

(1) QUALITY CONTROL ENGINEER: B. S. Chem. or Ch.E. min. 7 years quality control engineering experience desirable in synthetic fibers or chemical industries. Supervisory and plant product experience desirable. Responsible for planning of complete quality control programs, process capability analyses, plant trouble-shooting, process and production specifications, analysis and reporting of customer complaints, test methods and equipment design, experimental design incorporating the techniques of mathematical statistics.

(2) SENIOR CHEMIST: B. S. Chem. min. 7 years experience with some practical plant experience either in a production control lab or quality control group. Supervisory experience desirable. Experience in physical testing of yarns and fibers desirable. Knowledge or statistical quality control helpful. Must be able to assume responsibility of supervising 20 routine Chemical analysts, 15 people in yarn physical testing, and 5 chemists.

(3) Additional openings for Chemists and Chemical Engineers at lower experience levels.

Liberal Company Benefits, excellent opportunities for advancement and ideal working conditions. Complete resume including salary requirements should be addressed to

R. H. MEYER
Celanese Corporation of America
P. O. Box 1000
Narrows, Virginia

CONSULTING SERVICES

Responsibility of the American Society for Quality Control, Inc., for Consulting Services advertising is limited to certification that advertisers hold the grade of membership in the Society stated in their advertisements. Qualification requirements for the several grades of membership are set forth in the Constitution of the Society.

EDWARD A. REYNOLDS
Fellow, ASQC
Ligonier, Pa.

BERNARD HECHT
Quality Control & Reliability Specialist
Senior Founding Member, ASQC
Planning and Staffing
Q. C. Organizations
Training in Statistical Methods
Quality Assurance Programs
5410 Wilshire Blvd. Los Angeles 36, Calif.
WEbster 8-0121

R.R. 3, Box 258
Greenwood, Indiana
SUTHERLAND-JACOBSON & ASSOCIATES
Consultants in Quality Control
Inspection Procedures, Process Controls, Statistics for Research and Development
M. L. SUTHERLAND, Ph D. Fellow ASQC
H. J. JACOBSON Fellow ASQC

Management Controls
FOUNDED IN 1945
References and Literature on Request
Senior Partner: W. E. JONES *Fellow, ASQC*
699 Rose Ave. DES PLAINES, ILL. *Vanderbilt* 4-6533

Consulting Services in Quality Control
Since 1945
RALPH E. WAREHAM
Fellow, ASQC
122 Orchard Ridge Chappaqua, New York
Telephone Chappaqua 1-0715

Quality Control Consultant
HARMON S. BAYER
Fellow, ASQC
1154 Book Building Detroit 26, Michigan
Telephone WOodward 5-3796

QC Planning Defect Prevention
LEONARD A. SEDER
FELLOW ASQC
267 HAWTHORNE ST.
MALDEN, MASS.
DAvenport 4-5446
Organizing for Quality Training

FIVE REASONS WHY QUALITY CONTROL MEN ARE CHOOSING GENERAL TRANSISTOR

Quality control is a painstaking technique for endowing components and systems with hidden assets of performance reliability. The quality control manager has an obligation to company and customer alike to mold top standards of quality into the equipment.

Alert quality control supervisors across industry find that by specifying General Transistor they can run a production operation with unprecedented smoothness, and deliver end equipment with endlessly duplicated high quality . . . the hidden assets which spark high reliability.

These assets are built into every transistor and diode product because GT has taken pains in the following ways:

1. GT continually expands its semiconductor research program in order to develop products to suit its customers' needs.
2. GT selects only the highest quality materials and imposes the most rigid process controls and production standards.
3. GT semiconductor products are designed to stringent military and commercial specifications, calling for the most demanding environmental and operational capabilities.
4. GT's 100% final inspection of all parameters backs up exhaustive statistical process inspection.
5. GT germanium and silicon transistors and diodes are warranted to be free of defects caused by faulty materials or poor workmanship.

The benefits and advantages of such precision and adherence to technical standards are being acknowledged day after day. Every month GT transistors and diodes are being specified for use in millions of dollars worth of newly manufactured equipment (computers, missiles, military electronics and telemetering packages).

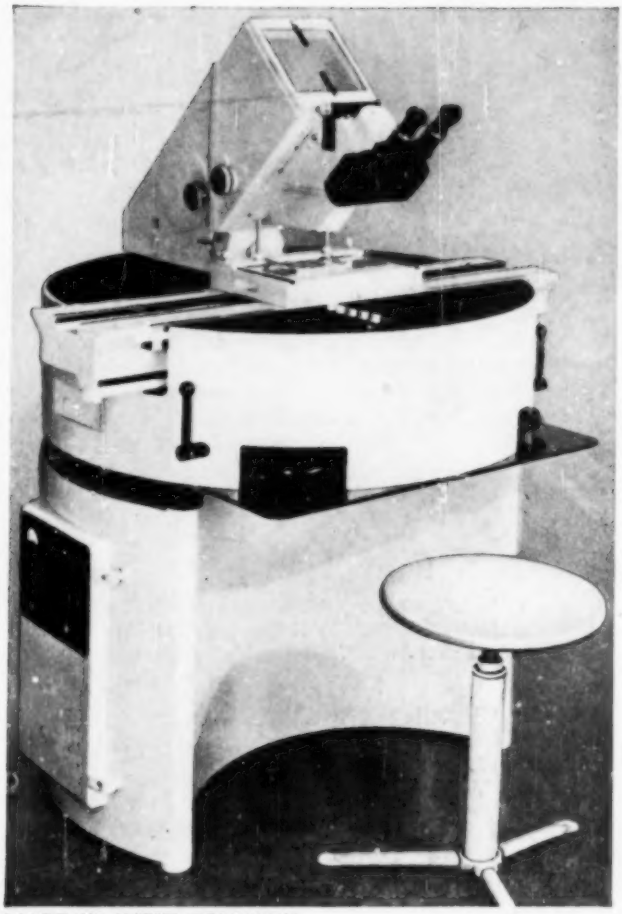
Simplify your quality control problem . . . use GT.

"YEARS AHEAD IN RELIABILITY"

GENERAL TRANSISTOR

CORPORATION

91-27 138TH PLACE • JAMAICA 35, NEW YORK



MADE IN WEST GERMANY

NEW...

CARL ZEISS

Universal Measuring Microscope

•

Utmost accuracy and versatility

Combines a series of different measuring instruments

This new instrument enables you to handle the most varied problems with the greatest ease. Measurements can be made in plane rectangular and polar coordinates as well as in three-space rectangular and cylindrical coordinates.

The instrument embodies high precision glass scales and circles which can be read respectively to .00005 inch and 1′ of arc. By means of a new beam-splitting device, line and center symmetrical measurements can be made by a single or double reversed image in complementary colors. Certainty of setting is thereby greatly increased, and extremely difficult precision parts can be checked in far shorter time, with higher accuracy then ever before.

An optical internal-measuring device permits measurements of smallest holes without any physical pressure.

Inclined binocular tube affords most comfortable viewing. Push-button control automatically projects the specimen image and all scales into binocular tube. Offers many other features such as comparison drawing device, projection and photographic attachments, etc.

Write for booklet on this most advanced instrument

CARL ZEISS, INC.

485 FIFTH AVENUE, NEW YORK 17, N. Y.

GUARANTEED UNINTERRUPTED REPAIR SERVICE